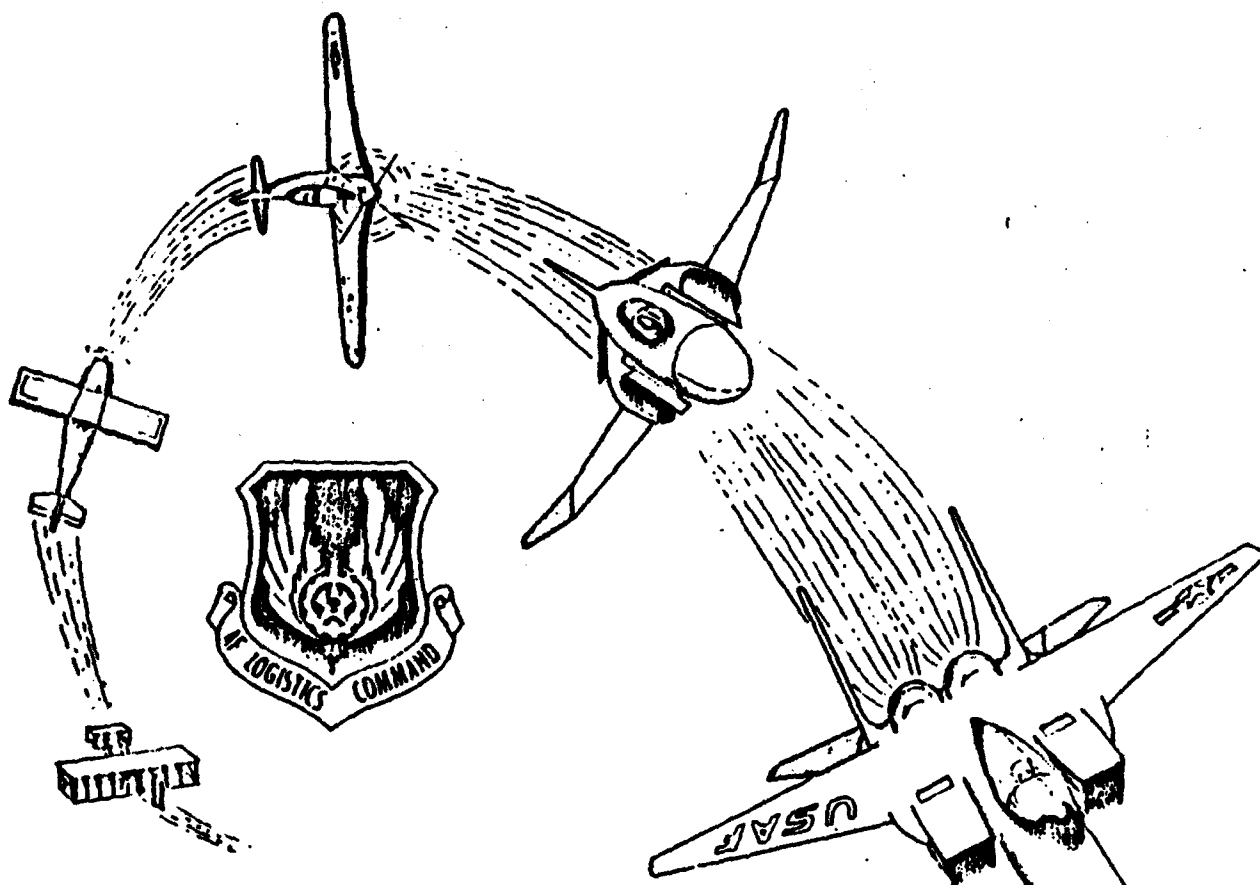


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# AIR FORCE LOGISTICS COMMAND

## MATERIEL ANALYSIS

DTIC FILE COPY



DPEM Indicators

Robert J. Appelbaum, Jr.

HQ AFLC/MMAA

May 1988

*FINAL rept.*

This document has been approved  
for public release and unless the  
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# ABSTRACT

Currently, there is no way to quantify the effects of changes in the level of Depot Purchased Equipment Maintenance (DPEM) funding. In our analysis, we identify a series of indicators, grouped into three major categories, which can be used to show the effect of these funding changes.

## EXECUTIVE SUMMARY

In this report, we describe the development of a series of indicators which can be used to construct a picture of the effects of changes in the level of Depot Purchased Equipment Maintenance (DPEM) funding.

*The author*  
We group our indicators into three major categories; depot level indicators, base level repair and support indicators, and mission support indicators. This set is necessary to get a complete picture of the effects of funding changes. They can be used to explain not only the funding changes effects, but also unexpected changes in one or more of the individual indicators.

*this the author*  
As a result of our analysis, we recommend the use of these indicators as a management review tool and as a method for justifying DPEM budgetary requests.

*Weymouth, MA From Depots Command (VA) ←*

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## CHAPTER 1

### THE PROBLEM

#### BACKGROUND

The Headquarters Air Force Logistics Command (HQ AFLC) Rivet Repair Steering Committee (RRSC) tasked us to develop a method to measure the effects of changes in the Depot Purchased Equipment Maintenance (DPEM) funding levels. There have been large reductions in the current fiscal year's DPEM budget and the current estimates for future funding remains bleak. AFLC has predicted a significant decrease in Air Force support as a result of the DPEM funding shortfalls and needs a way to measure the actual impact. The scope of this project is confined to the impact that results from exchangeable repair under funding.

#### PROBLEM STATEMENT

The Air Force Logistics Command does not have a way to quantify the effects of changes to the exchangeable spares portion in the Depot Purchased Equipment Maintenance fund.

#### OBJECTIVES

1. Determine and develop a method for quantifying the effects of changes in DPEM funding.
2. Recommend changes to current policy and procedures as required.

## CHAPTER 2

### ANALYSIS

#### OVERVIEW

We document our analysis in three sections. In the first section, we identify our approach. In the second section, we describe performance indicators. In the third, we describe how we intend to collect and use the indicators.

#### APPROACH

Currently, there is no way to quantify the effects of changes in DPEM funding profiles. There are a number of sources for raw data that could be used to relate changes in DPEM funding to mission support. For example, the Commanders Information Network System (CINS) includes data on fill rates and overall Fully Mission Capable (FMC) rates but these are not directly related to DPEM funding.

The problem becomes one of isolating the effects of one program given the complex interaction of influences that affect any type of indicator developed. So, we developed a series of indicators that, when collectively analyzed, can "build" a picture of the effects of changes in DPEM funding. When developing this set of indicators we considered the following "criteria."

a. The method developed must consider the effects of changes in DPEM funding on a variety different operational areas. In other words, the method must address not only direct mission support but also must address areas whose performance in turn is reflected in direct mission support. This is necessary for the completion of detailed analysis in response to "why did this occur" questions.

b. The method must include a way to determine the effects of changes in DPEM funding on a cross-section of Air Force (AF) weapon systems. This ensures that all operating commands are represented and ensures that the method addresses all forms of the Air Force (AR) mission--tactical, strategic, and airlift.

c. The method must be composed of a number of indicators and not just "one or two." Due to the number of and complex interaction of influences to any indicators developed, it is very important to construct a system which can explain unexpected changes in one or more of the individual indicators.

### DEPOT LEVEL PERFORMANCE INDICATORS

We categorize our performance indicators in three areas: depot level indicators, base level indicators, and mission support indicators. In general, this set of indicators can be used to "build" a picture of the effect of changes in DPEM funding. The indicators:

a. Consider not only the effect on direct mission support but also the on the mission support mechanism, i.e., base and depot operations. To do this, we identify indicators that address effects on depot level repair, base level repair and support actions, and peacetime and wartime mission capability.

b. Ensure that a cross-section of weapon systems are considered by using data from weapon systems from three major operating commands.

c. Includes a variety of indicators--37 in total--so that the system can explain unexpected changes in one or more of the individual indicators.

### DEPOT LEVEL INDICATORS

We show a sample of the individual charts within the depot level areas in Appendix A. They reflect some of the changes in the depot process that occurs when funding levels change dramatically. Table 2-1 identifies the range of these indicators and the expected change which results from a reduction in DPEM funding.

### DEPOT LEVEL DPEM INDICATORS

AREAS OF EXAMINATION	EXPECTED CHANGE RESULTING FROM FUNDS REDUCTION
Number of Reparables at the Depot	UP
Total Exchangeable Production Qty	DOWN
Number of AWP Incidents	UP
Measure of Production Efficiency	DOWN
Requirement Not Negotiated Due to Lack of Parts	UP
Number of EOQ Depot Demands	DOWN
Number of Base NRTS Actions	DOWN
Value of Computed Requirement and Carryover	UP

TABLE 2-1

As is shown on this chart, there are a number of indicators that can be used to reflect different portions on the effect on the depot. Each indicator will be explained in turn.

1. **The Number of Reparables at the Depot** identifies the number of unserviceable assets that are available for repair (and are needed) that are not being repaired. We expect this measure to increase because funds are not available to accomplish the needed repair.

2. **Total Exchangeable Production Quantities** shows the total number of exchangeable items repaired over a given period of time. Under funding means less repair so we expect this measure to decrease.

3. **The Number of AWP Incidents (base and depot)** identifies the number of unserviceable end items that could not be repaired because component parts were not available. We expect this number to increase because component parts that are needed for end item repair that are also repaired would be in short supply.

4. **The Measure of Production Efficiency** measures the cost of maintenance labor. Under funding means less of most items will be repaired meaning less efficient maintenance.

5. **The Requirement Not Negotiated Due to Lack of Funds** is the portion of the total identified requirement that could not be negotiated with maintenance because AFLC could not "afford" to pay for the repair. We expect this to increase with under funding.

6. **The Number of Economic Order Quantity (EOQ) Depot Demands** shows the number of times that the depot maintenance facility requested EOQ parts. We expect this to decrease with DPEM under funding because the level of depot repair has been reduced.

7. **The Number of Base Not Repairable This Station (NRTS) Actions** reflects the number of times that a base returned an unserviceable asset to the depot because it could not be repaired at that base. Under funding means the bases will take extraordinary measures to repair the asset vice returning it to the depot.

8. **The Value of the Computed and Carry-over Requirement** shows the total dollar value of the computed requirement and the dollar value of the carry-over requirement. The carry-over requirement is defined as that portion of the total requirement which was needed yet not funded.

## BASE LEVEL INDICATORS

We show the set of base level repair and support indicators in Appendix B. In general, they reflect base level actions to maintain current levels of operational activity. The list is presented in Table 2-2.

### BASE LEVEL REPAIR AND SUPPORT INDICATORS

AREAS OF EXAMINATION	THE EXPECTED CHANGE RESULTING FROM FUNDS REDUCTION
Retail WRSK Withdrawals	UP
Retail Investment Fill Rates	DOWN
Base Level Cannibalization Actions	UP
Base Level Wavier Incidents	UP

TABLE 2-2

1. **Retail War Readiness Spares Kits (WRSK) Withdrawals** has two parts--total WRSK withdrawals and WRSK withdrawals used to satisfy a Mission Capable (MICAP) incident. Both refer to actions by a base to maintain their level of peacetime activity using exchangeable items that have been designated for wartime activity. In most cases this is because the base was unable to secure a serviceable asset through repair. We expect the number of withdrawals to increase. Less repair dollars less of an item's total number of assets is serviceable and if demand for the item remains relatively constant then there will not be sufficient serviceable assets to cover the demand.

2. **Retail Investment Fill Rates** identifies the number of base level requisitions for exchangeable items were satisfied over a given period of time. As with the first base level indicator, this has two parts--Retail Issue Effectiveness and Retail Stockage Effectiveness. Issue Effectiveness refers to the total number of requisitions that were satisfied regardless of whether the items has an existing stock level. Stockage Effectiveness refers to the satisfaction of requisitions for only those items that have an existing stock level at that base. In both cases, the we expect the result of DPEM under funding to be a decrease in each indicator. This is because the lack of repair dollars means less repair (reduced supply) relative to the demand for the item.

3. **Base Level Cannibalization Actions** reflects the number of times that a base was forced to take serviceable components off an unserviceable end item in order to make another asset serviceable. Again, this is in two parts--actions to preclude a MICAP and actions to satisfy a MICAP. We expect both indicators to increase with DPEM under funding. This is again related to the decrease in supply of serviceable component items due to the inability to repair them at the depot level (due to decreases in DPEM funds).

4. **Base Level Wavier Incidents** shows the number of times that a base requests the authority to repair an item that is normally repaired at the depot level. Given reduced ability of the depot to repair the end items (due to DPEM funding constraints), we expect the bases to request the authority to increase the level of organizational and intermediate (O&I) level maintenance in an attempt to meet their demand for some end items.

#### MISSION SUPPORT INDICATORS

The last set of indicators proposed is directly related to operational mission support. In all cases, except for the indicator on Fully Mission Capable (FMC) rates, they reflect data on selected aircraft. These aircraft have been selected because they are representative of the total mission of the AF. Aircraft have been selected from three major operating commands--the Tactical Air Command (TAC), the Strategic Air Command (SAC), and the Military Airlift Command (MAC)--and include aircraft representing fighter capability, fighter/bomber capability, bomber capability, and transport capability. The complete list of aircraft is given in Table 2-3.

#### TYPES OF AIRCRAFT SELECTED

TAC	SAC	MAC
F/RF-4	B-52	C-5
F-15	KC-135	C-141
F-16	KC-10	C-130
A-10		
A-7		
F/EF-111		

TABLE 2-3

We present the individual charts for the Peacetime and Wartime Capability indicators in Appendix C. These reflect data on the amount of capability that each type of aircraft possesses as portrayed in such areas as MICAP Incidents (peacetime) and Day 30 Available Aircraft (wartime). Chart 2-4 presents the major groupings for these indicators.

#### PEACETIME AND WARTIME CAPABILITY INDICATORS

AREAS OF EXAMINATION	THE EXPECTED CHANGE RESULTING FROM FUNDS REDUCTION
FMC Rates Across Weapon Systems	DOWN
Opening MICAP Incidents for Selected A/C	UP
Day 30 Available A/C for Selected A/C	DOWN
Percent Total Sorties for Selected A/C	DOWN
WRSK/BLSS Fill Rates for Selected A/C	DOWN
Unit Logistics C-Ratings for Selected A/C	DOWN

CHART 2-4

Some of the information identified in Chart 2-4 (Total Sorties and Unit Logistics C-Ratings) will by definition be classified information. As a result, this information will not be presented in normal quarterly reports. However, the data and information will be available for review upon request.

1. **Fully Mission Capable (FMC) Rates Across Weapon Systems** shows the percent of the AF fleet that is Fully Mission Capable (FMC). With the decrease in DPEM funding, we expect this indicator to fall--due to the reduction in the supply of serviceable assets.

2. **Opening MICAP Incidents for Selected Aircraft** reflects the total number of MICAP incidents that are outstanding at the start of each month. We expect this number to increase in periods of DPEM under funding.

3. **Day 30 Available Aircraft for Selected Aircraft** shows the percent of the number of wartime authorized aircraft that are estimated to be available at day 30 of the war for selected TAC, MAC, and SAC aircraft. Given the effect of DPEM on the availability of serviceable assets, we expect this to show a decrease in the number of aircraft available in times of limited DPEM funding.

4. **The Percent Total Sorties for Selected Aircraft** provides an estimate of the percent of the total number of needed sorties that can be flown by each type of aircraft given current asset positions. This indicator will be shown for all stated aircraft except for the KC-10, the C-5, and the C-141. These aircraft are not currently in the Weapon System Management Information System/Sustainability Assessment Module (WSMIS/SAM) which is the estimating technique used to develop this indicator. We expect this indicator to decrease during periods of DPEM under funding.

5. **WRSK/BLSS Fill Rates for Selected Aircraft** shows the number of assets available versus the number authorized in the War Readiness Spares Kit/Base Level Self Sufficiency (WRSK/BLSS) kits for the KC-10, the C-5, and the C-141 aircraft. We expect this indicator to show a decrease during DPEM shortfalls.

6. **Unit Logistics C-Ratings for Selected Aircraft** reflect the estimated capability position of each unit at shown as a percent of the authorized number of combat coded aircraft for each unit that will be "available" at day 30. The ratings go from one to four with one the standard for the number of fully mission capable aircraft in each unit. We expect that these indicators will show a reduction in the overall number of units that are at the C-1 level in times of DPEM under funding.

## COLLECTION AND USE OF DPEM INDICATORS

In this section we describe how we will collect the data and track the indicators. The data for all of the indicators come from a variety of sources including; the D041 Central Secondary Item Stratification (CSIS), the Base Level Management Report Summary (M32), and output from the WSMIS system. The data will be collected manually by representatives from the appropriate HQ AFLC directorates (see appendices for details) and will be forwarded to HQ AFLC/MMMA. Data on Total Sorties and Unit Logistic C-Ratings will be kept reviewed separately due to the classified nature of the data. It will be available for review but not reported in the normal quarterly report to the RRSC. This office will construct a data base using the ENABLE software data base management system in order to store and track all of the identified indicators.

These indicators will be used to quantify the effects of changes in the DPEM funding profile. In the current situation, these indicators can be used to defend upcoming budget submissions. They will allow the AF to "prove" to budget managers their claims about the effects of cutting DPEM funding. The AF will be able to identify these effects on mission support and can use these to estimate the effects of future proposed cuts in DPEM budgets.

## CHAPTER 3

### CONCLUSIONS AND ACTIONS

#### CONCLUSIONS

1. The current system does not include a method for quantifying the effects of changes in the level of the Depot Purchased Equipment Maintenance (DPEM) funding.
2. AFLC needs a series of indicators in order to "build" a true picture of the effects of changes in DPEM funding, identify the impact, and justify future repair requirement budgets.
3. Performance indicators must consider not only direct support indicators but also indicators showing indirect forms of support.
4. We have identified a series of indicators that will identify the depot, base, and mission impact of DPEM under funding.

#### ACTIONS

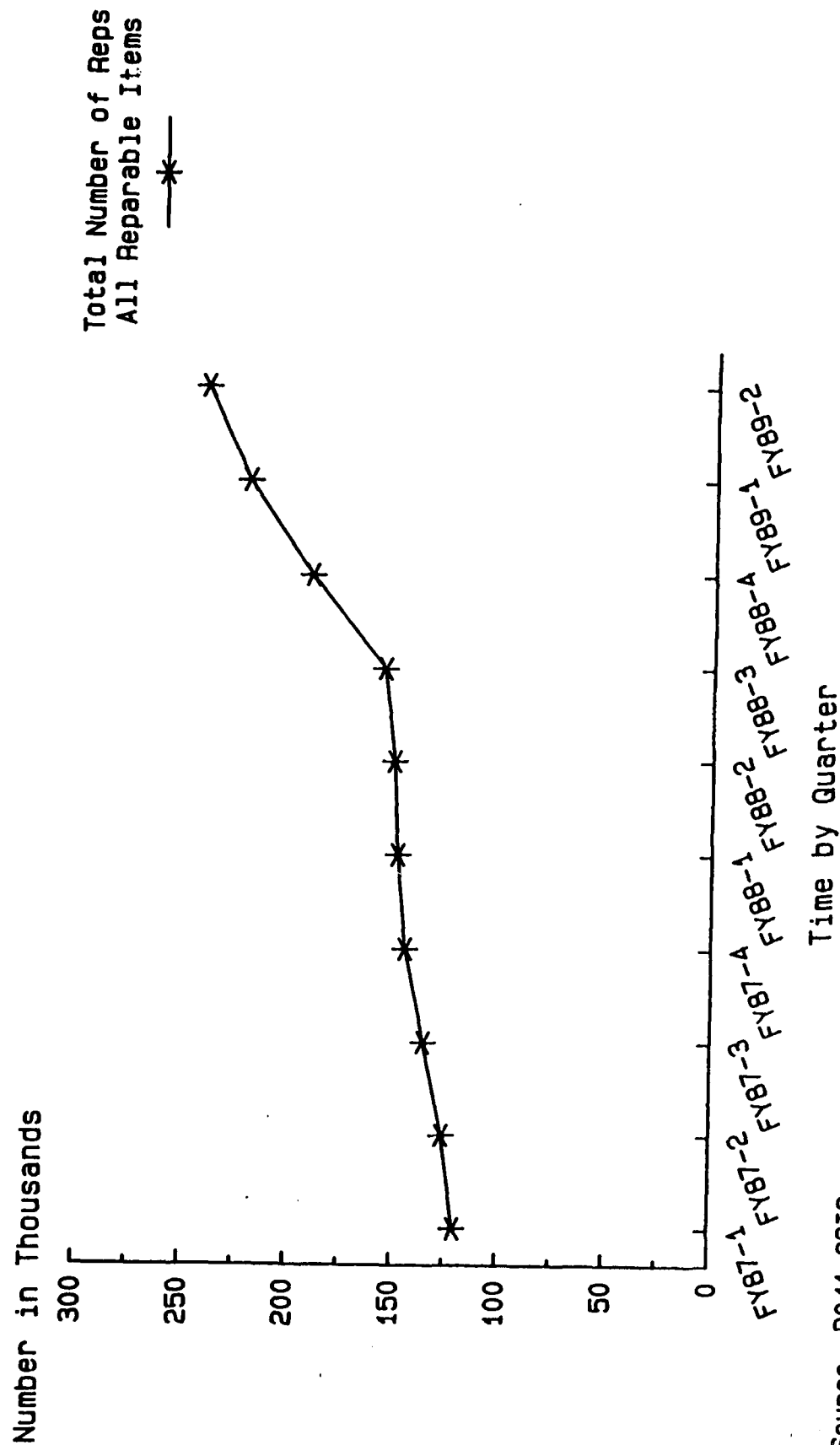
1. Construct a data base that contains all of the data required to produce the indicators outlined in this report. (OPR: HQ AFLC/MMM)
2. Develop an automated method for producing this set of indicators on a quarterly basis. (OPR: HQ AFLC/MMM)
3. Use these indicators as the method for showing the effects of changes in the level of DPEM funding and justifying future repair requirement budget submissions. (OPR: HQ AFLC RRSC)

## APPENDIX A

### DEPOT LEVEL, DPDM INDICATORS

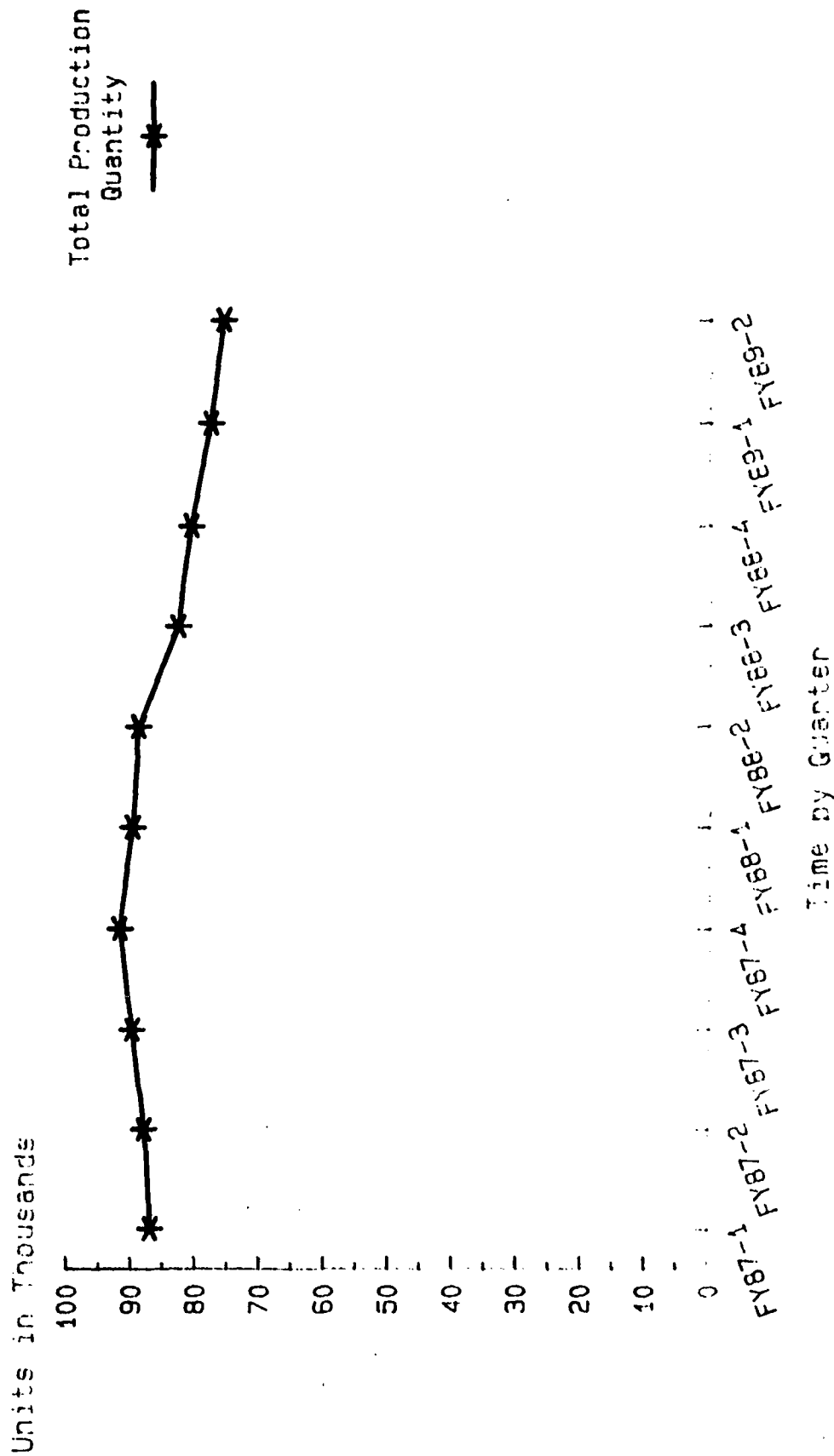
AREAS OF EXAMINATION	EXPECTED CHANGE RESULTING FROM FUNDS REDUCTION
Number of Reparables at the Depot	UP
Total Exchangeable Production Qty	DOWN
Number of AWP Incidents	UP
Measure of Production Efficiency	DOWN
Requirement Not Negotiated Due to Lack of Parts	UP
Number of EOQ Depot Demands	DOWN
Number of Base NRTS Actions	DOWN
Value of Computed Requirement and Carryover	UP

# NUMBER OF REPARABLES AT THE DEPOT AGGREGATED BY QUARTER



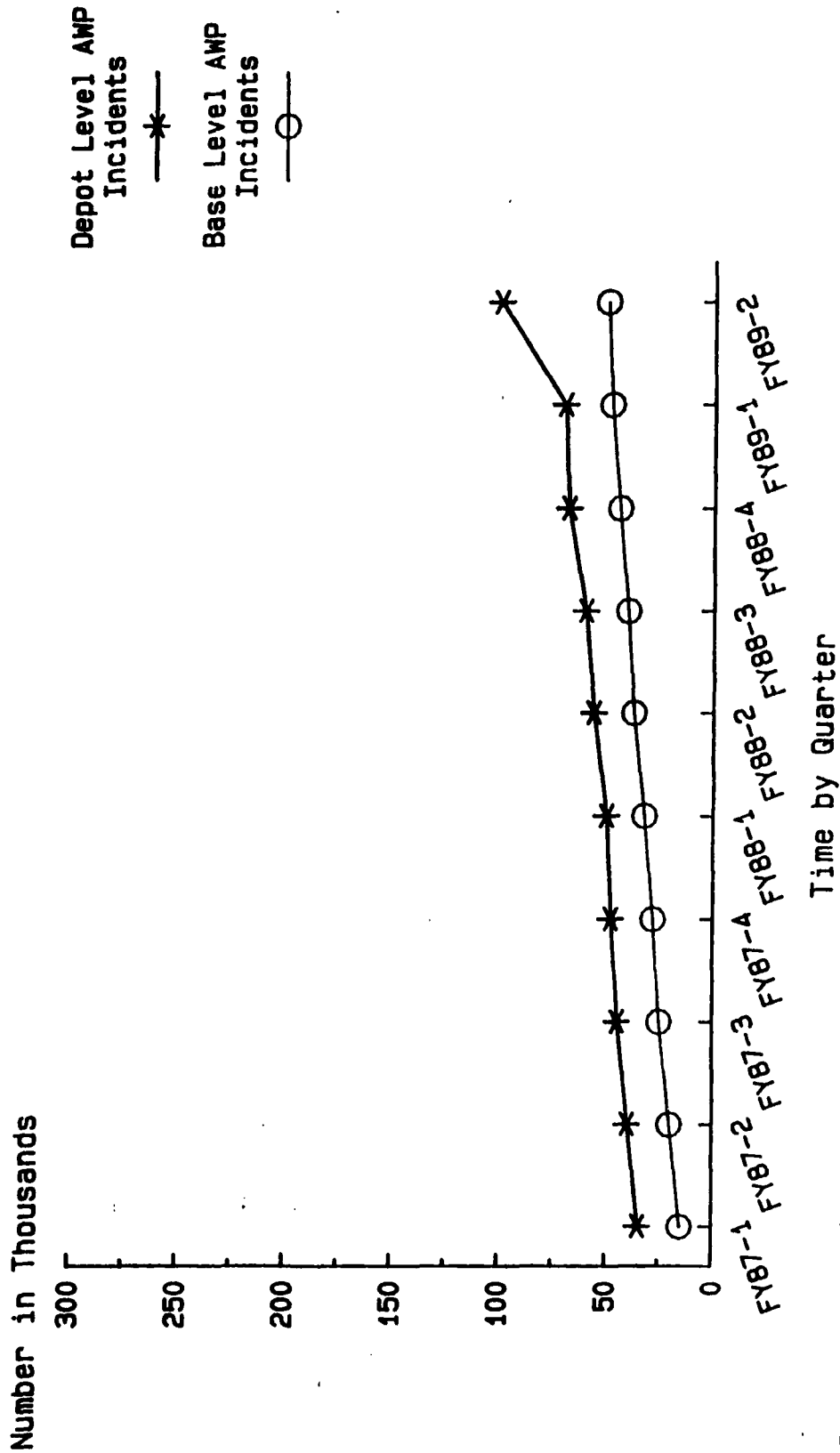
Source--D041 CSIS  
OPR-HQ AFLC/MMM

# TOTAL PRODUCTION QUANTITIES EXERCISES 1987-1989



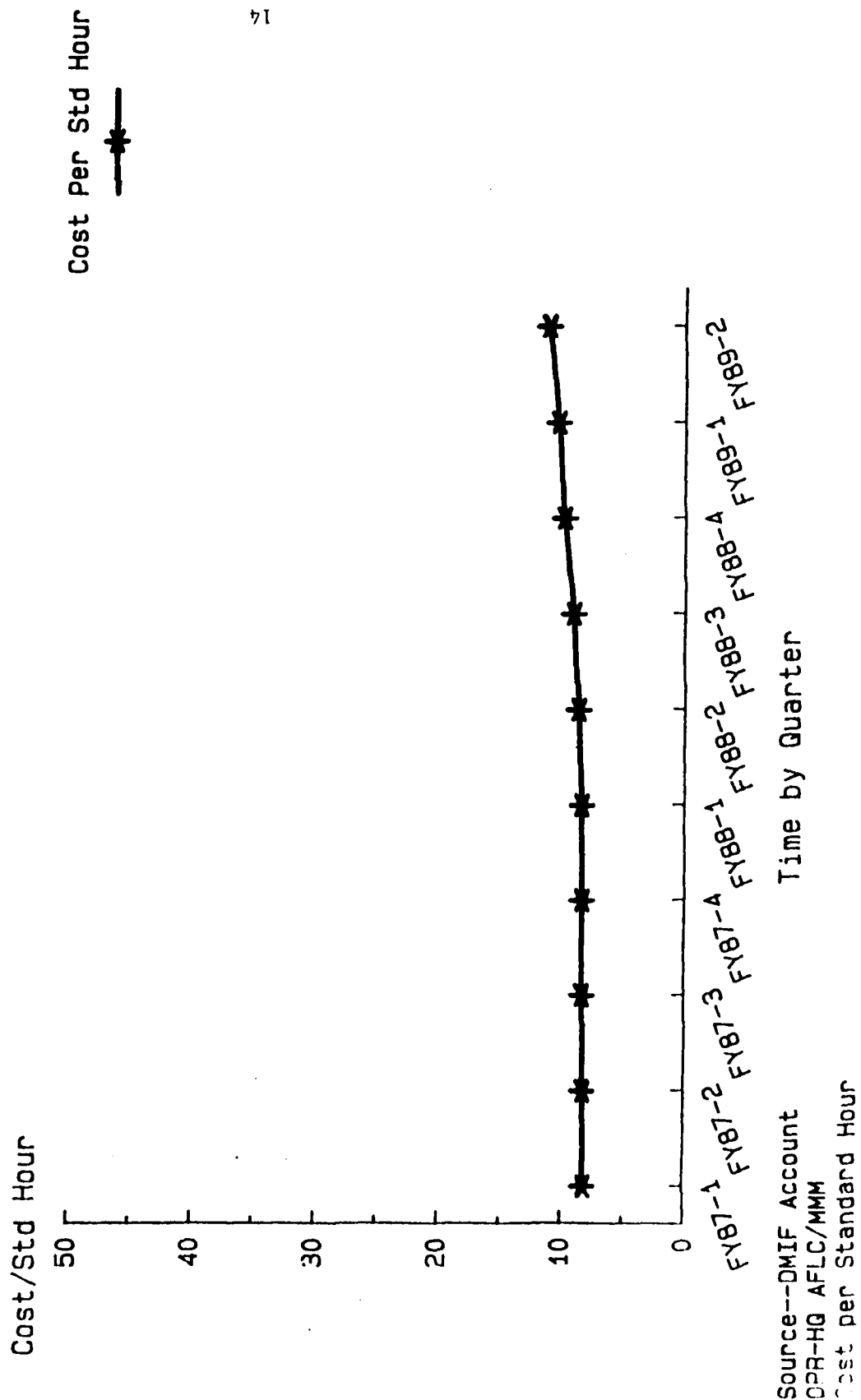
Source--60190  
GPO: 1989-1-100000

# AWAITING PARTS INCIDENTS AGGREGATED BY QUARTER

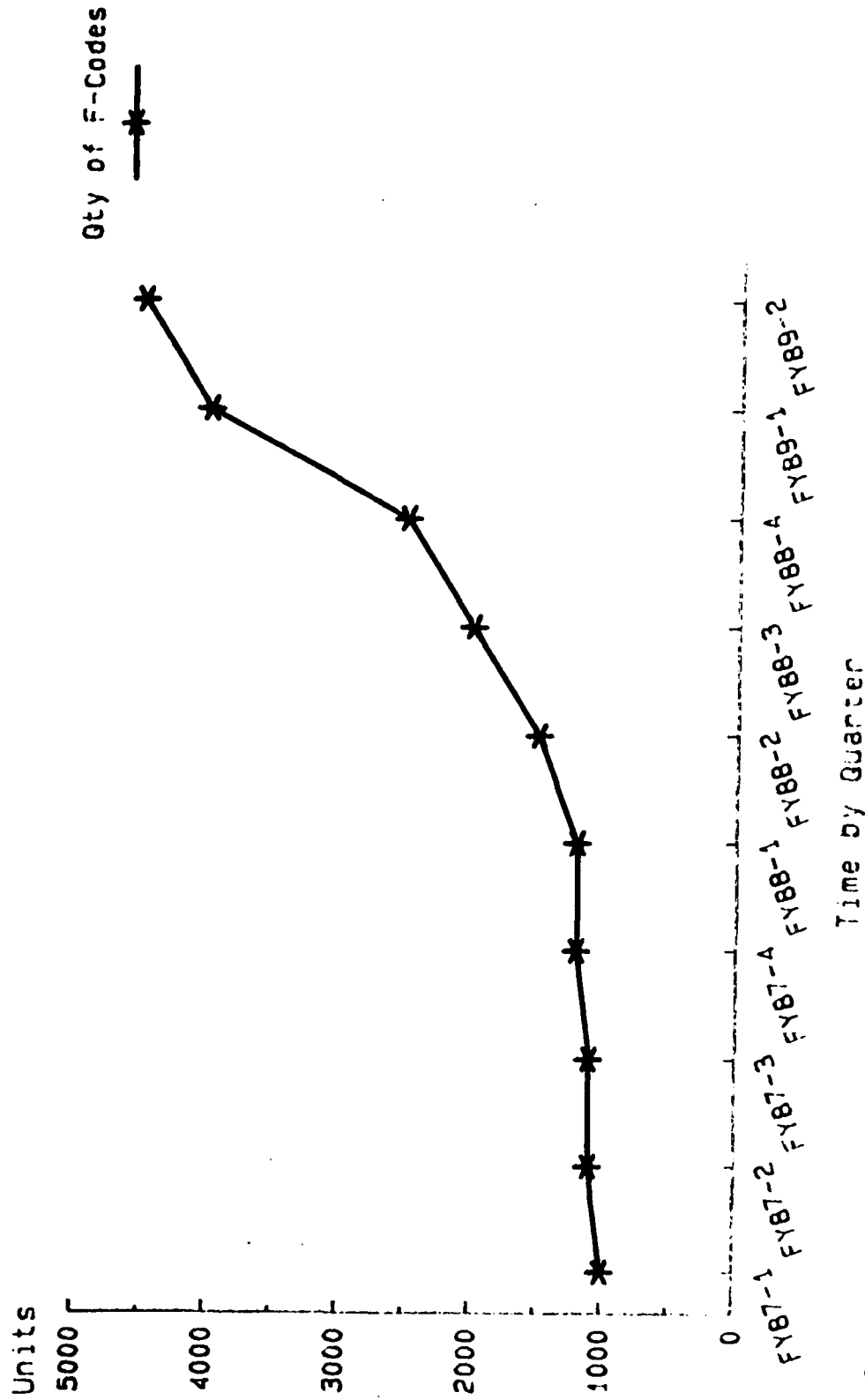


Source--G005M (EPS)  
OPR-HQ AFLC/MML

# PRODUCTION EFFICIENCY EXCHANGEABLE REPAIR

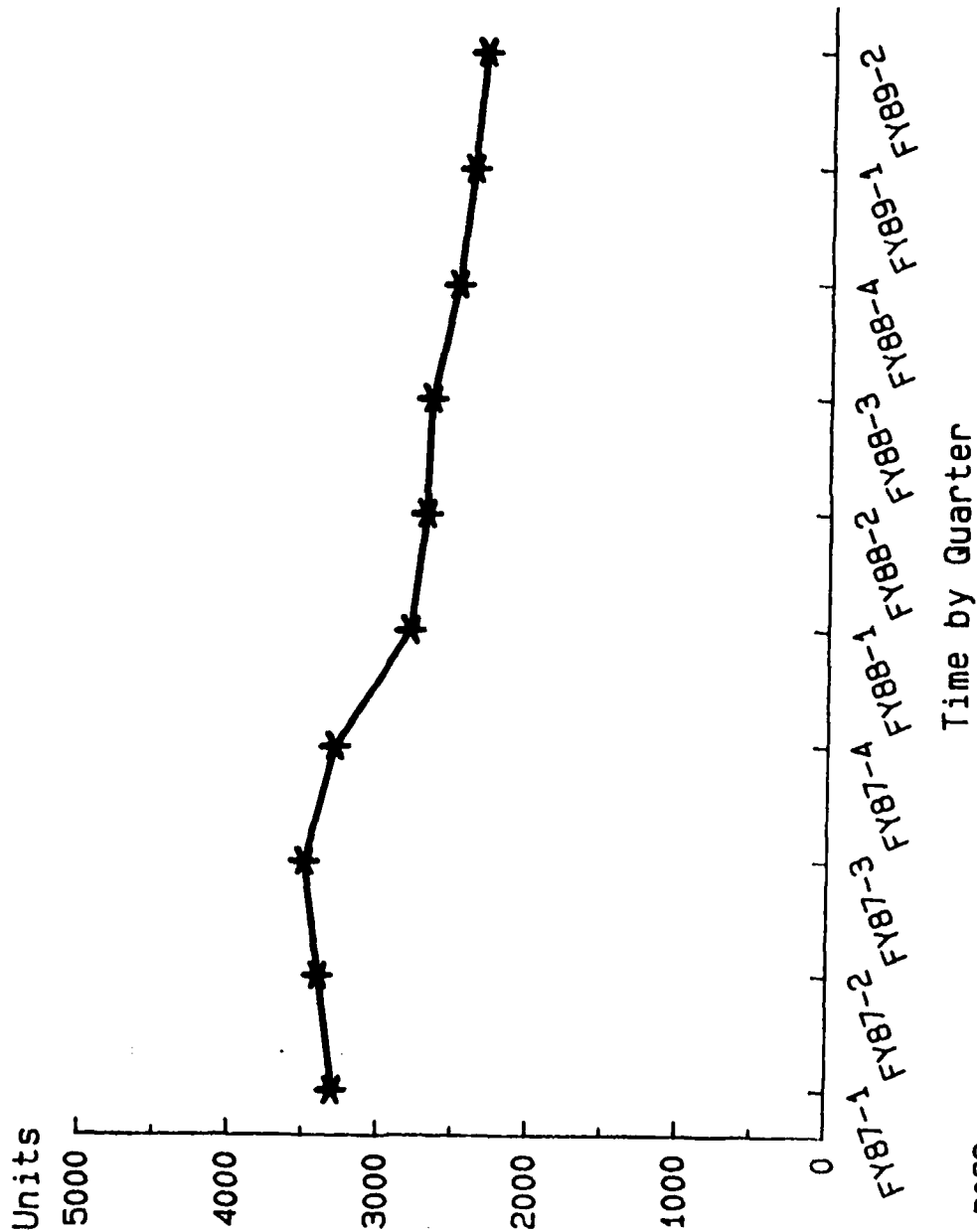


# REQUIREMENTS NOT NEGOTIATED DUE TO LACK OF FUNDS EXCHANGEABLE REPAIR



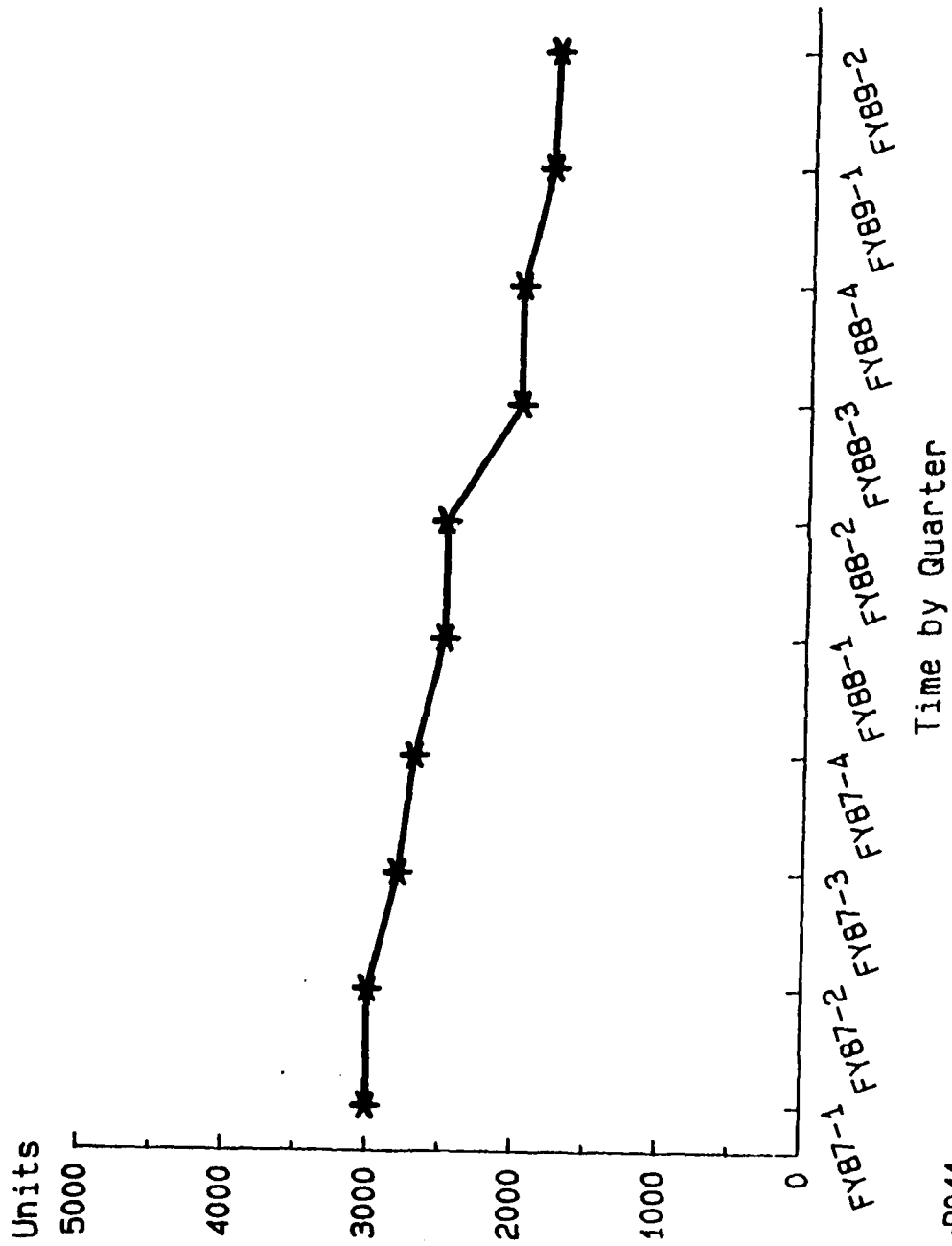
Source--G019C  
OPR-HQ AFIC/MW

# TOTAL NUMBER OF EOQ DEPOT DEMANDS



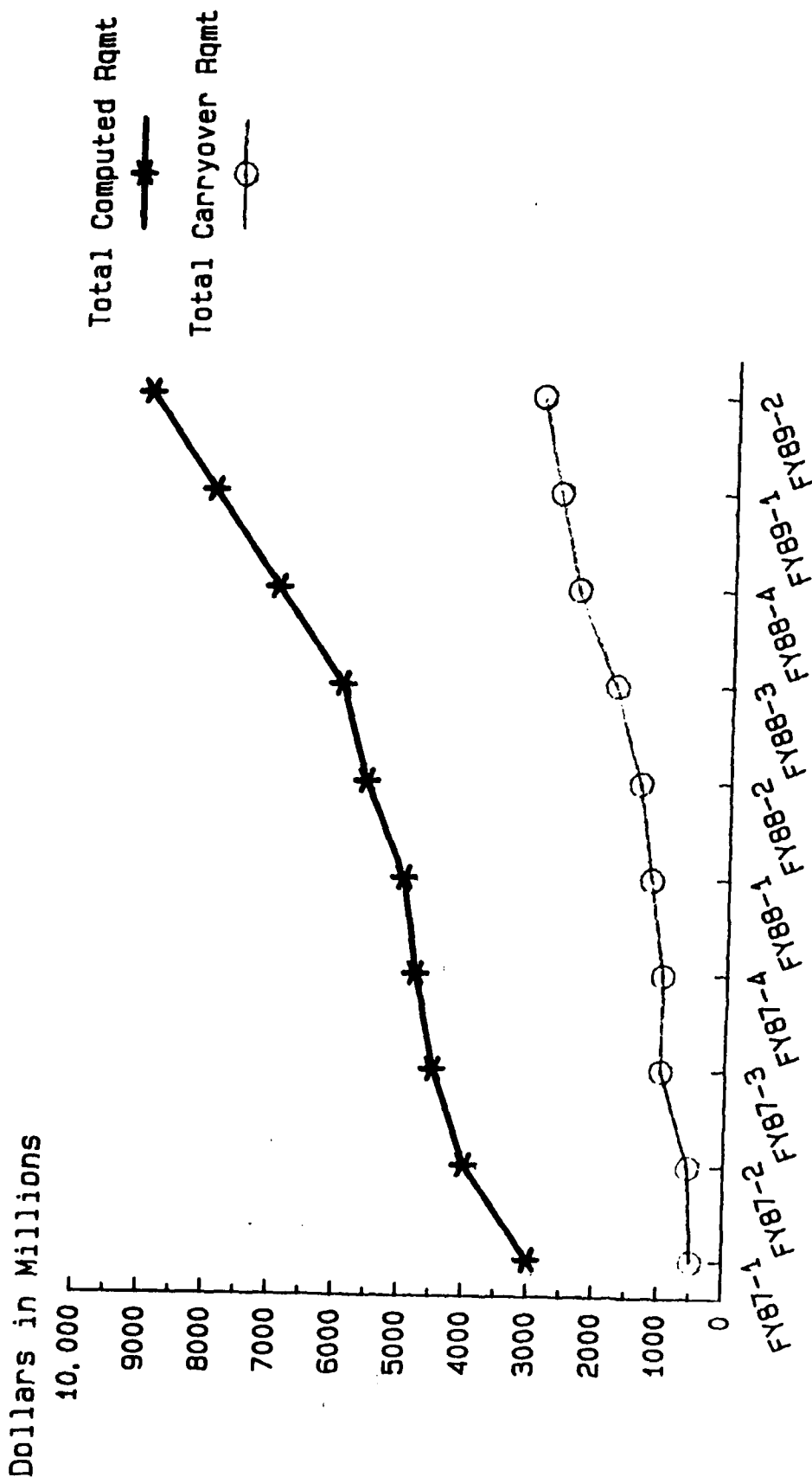
Source--D033  
OPR-HQ AFLC/MMM

# TOTAL NUMBER OF BASE NRTS ACTIONS



Source--D041  
OPR-HQ AFLC/MMM

# TOTAL DOLLAR VALUE OF COMPUTED REQUIREMENT



Source--D041 CSIS

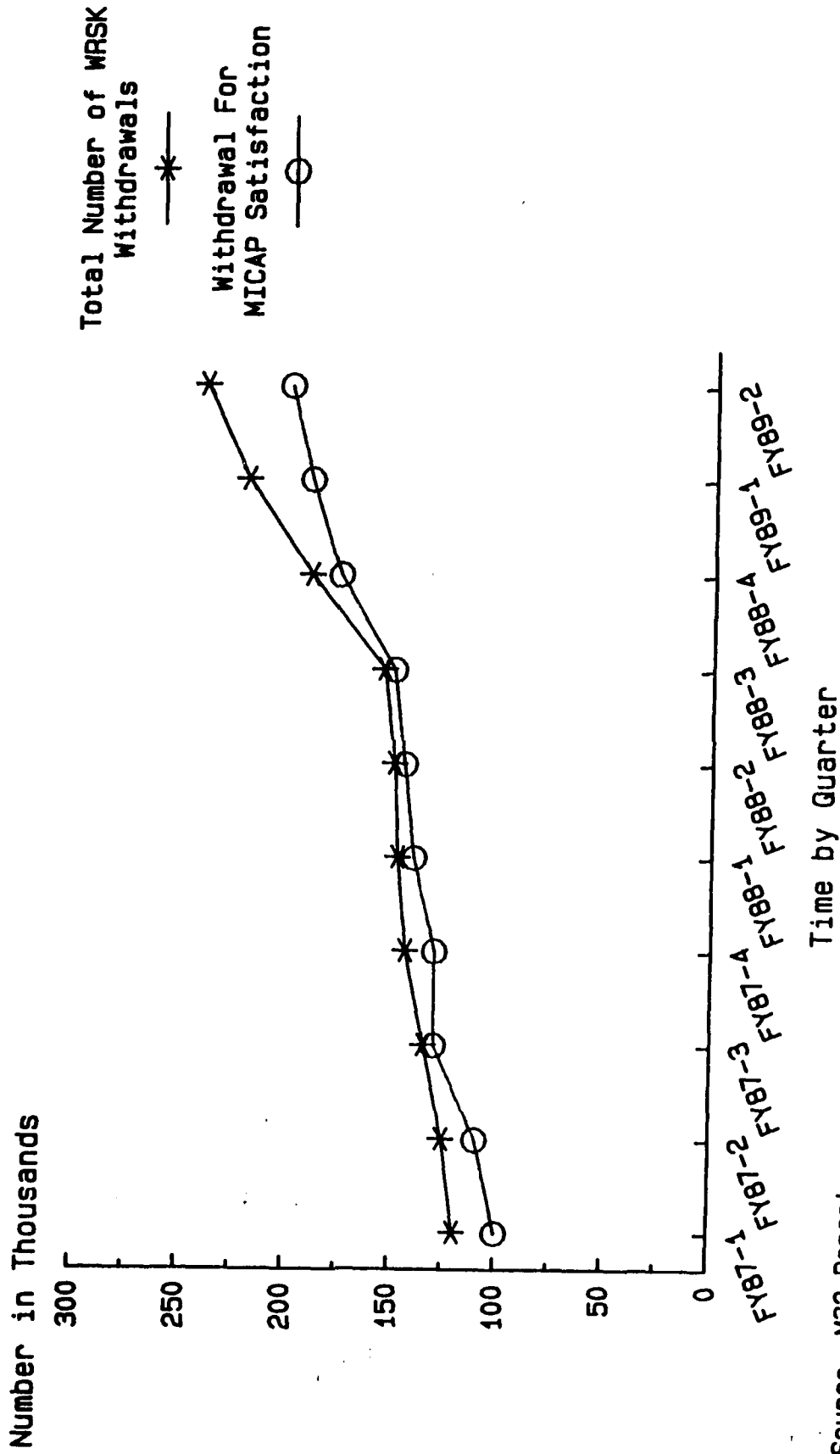
OPR-HQ AFLC/MMM

APPENDIX B

BASE LEVEL REPAIR AND SUPPORT INDICATORS

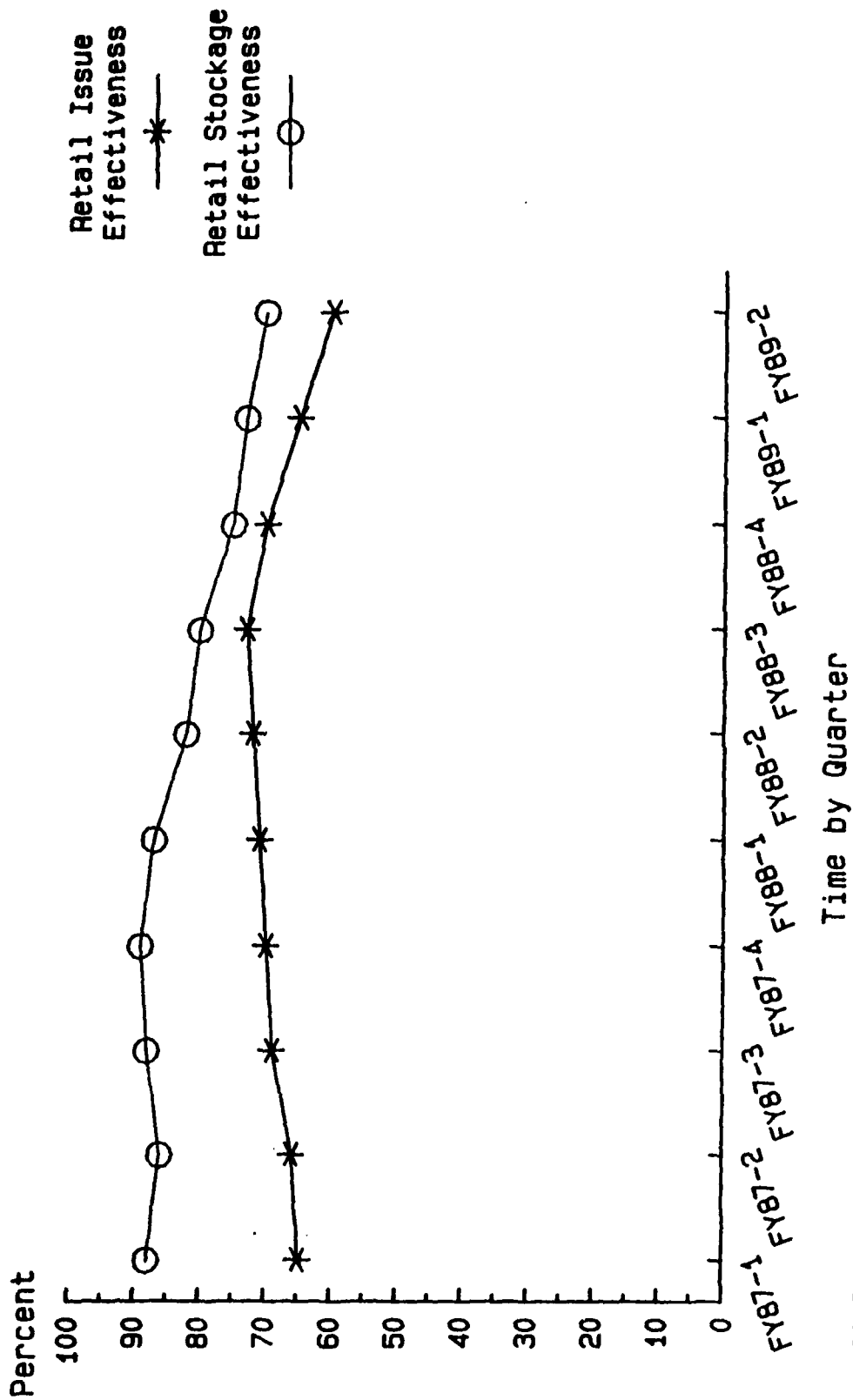
AREAS OF EXAMINATION	THE EXPECTED CHANGE RESULTING FROM FUNDS REDUCTION
Retail WRSK Withdrawals	UP
Retail Investment Fill Rates	DOWN
Base Level Cannibalization Actions	UP
Base Level Wavier Incidents	UP

# RETAIL WRSK WITHDRAWALS AGGREGATED BY QUARTER



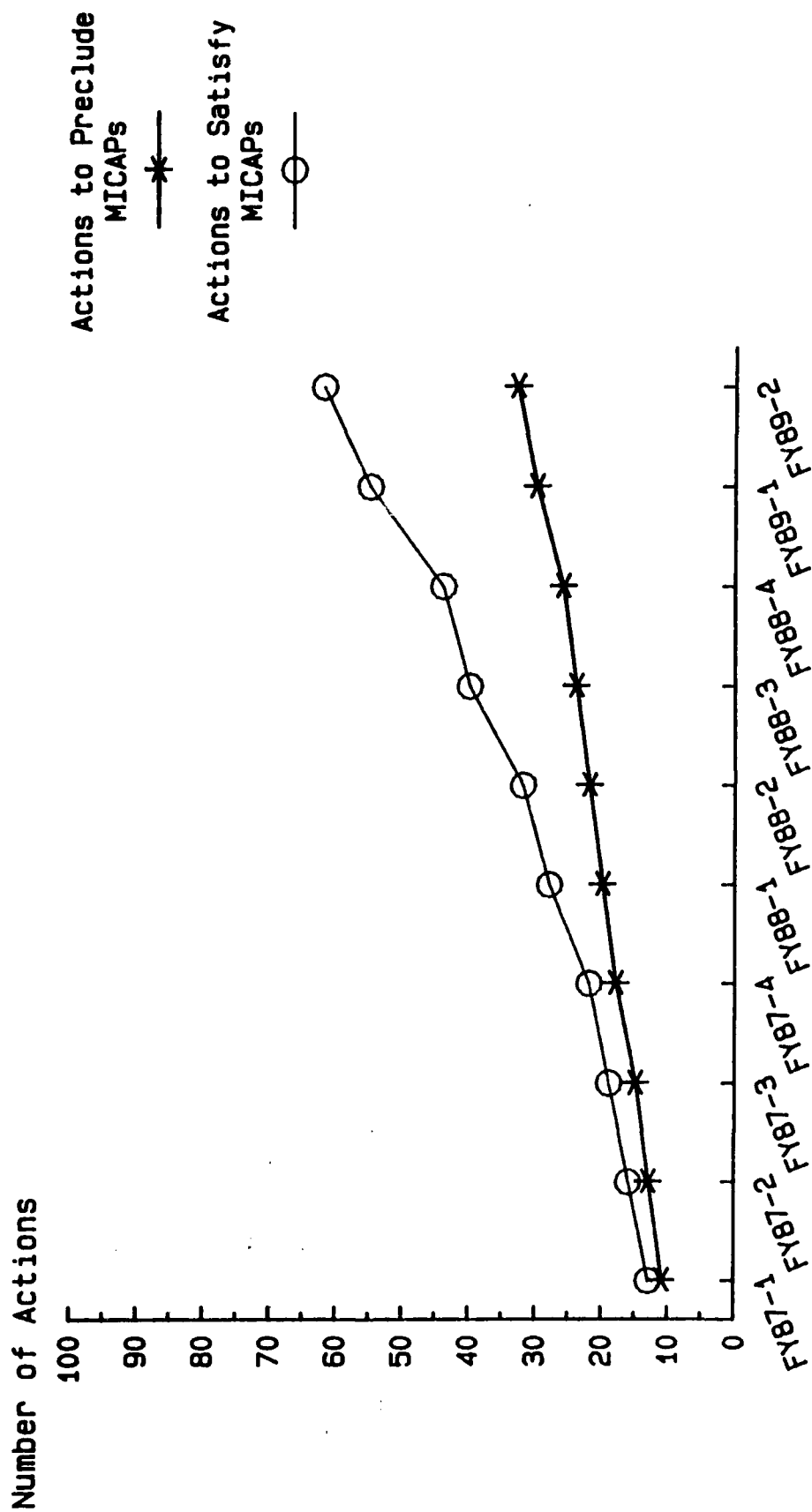
Source--M32 Report  
OPR-HQ AFLC/MML

# RETAIL INVESTMENT FILL RATES AGGREGATED BY QUARTER



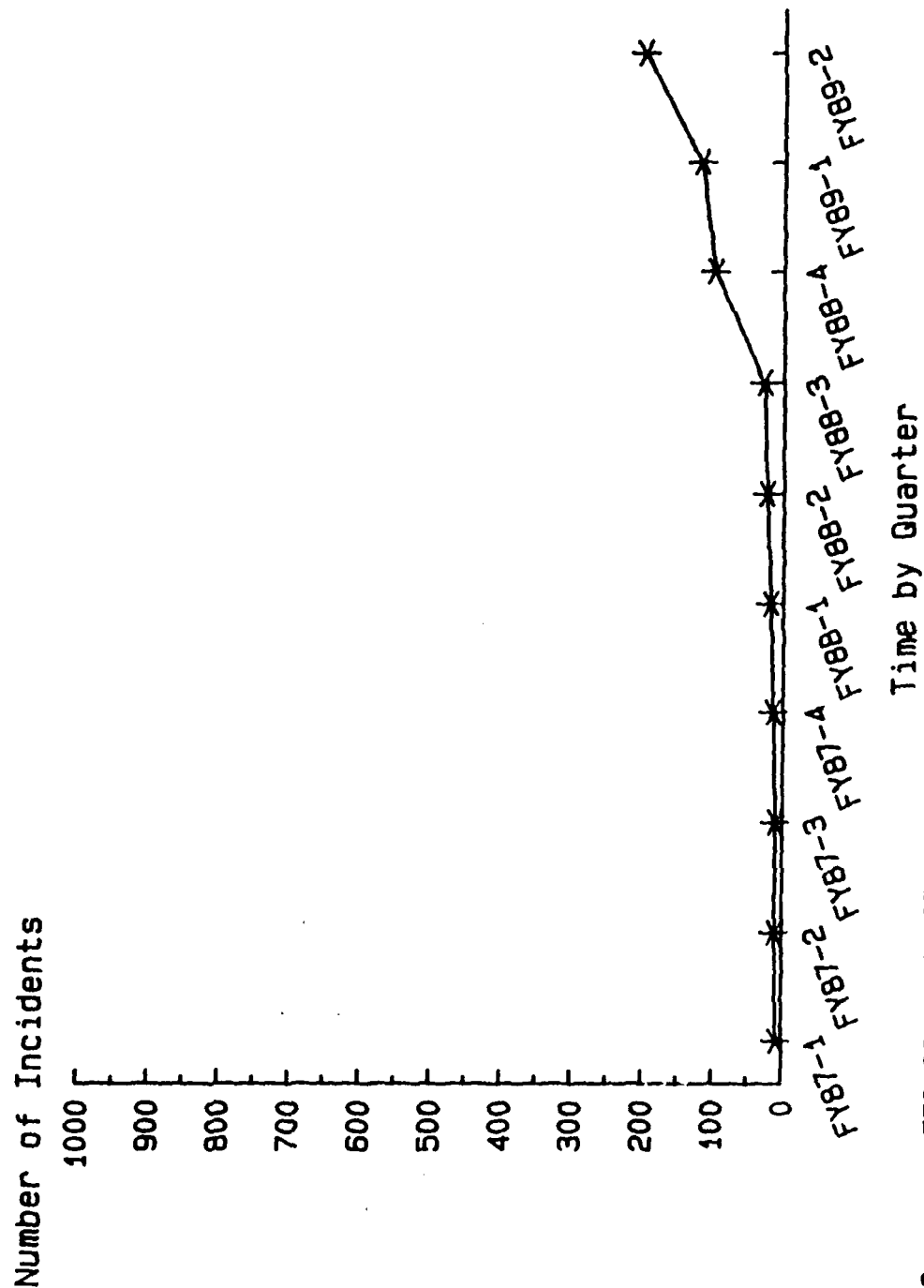
Source---M32 Report  
GPR-HQ AFLC/MML

# BASE LEVEL CANNIBALIZATION ACTIONS AGGREGATED BY QUARTER



Source---M32 Report  
OPR-HQ AFLC/MML

# BASE LEVEL WAVIER INCIDENTS AGGREGATED BY QUARTER



Source---AFTO 22s and 135s  
OPR-HQ AFLC/MML

Number of Waviers

\*

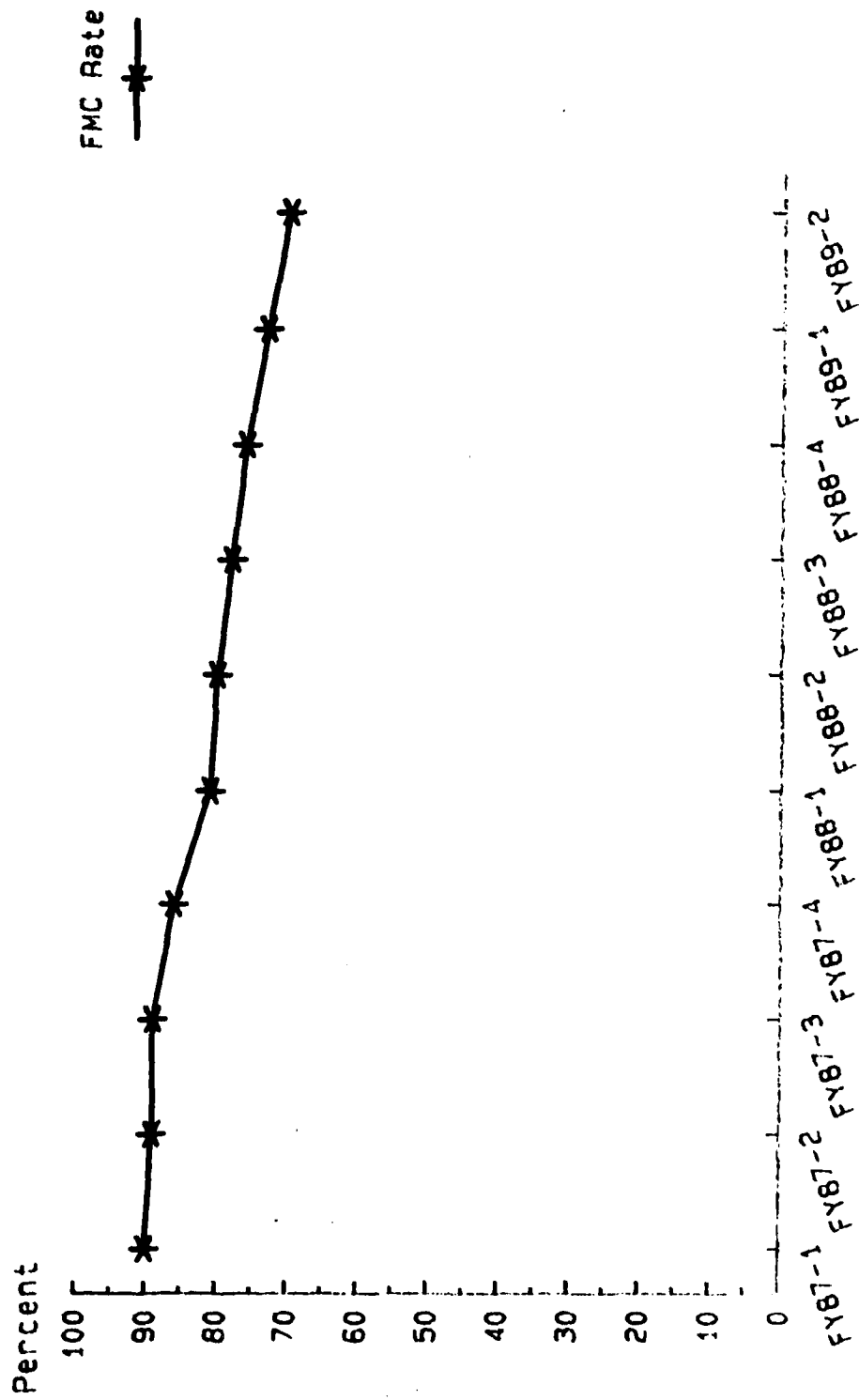
## APPENDIX C

### PEACETIME AND WARTIME CAPABILITY INDICATORS

AREAS OF EXAMINATION	THE EXPECTED CHANGE RESULTING FROM FUNDS REDUCTION
FMC Rates Across Weapon Systems	DOWN
Opening MICAP Incidents for Selected A/C	UP
Day 30 Available A/C for Selected A/C	DOWN
Percent Total Sorties for Selected A/C	DOWN
WRSK/BLSS Fill Rates for Selected A/C	DOWN
Unit Logistics C-Ratings for Selected A/C	DOWN

Some of the information identified in Chart 2-4 (Total Sorties and Unit Logistics C-Ratings) will by definition be classified information. As a result, this information will not be presented in normal quarterly reports. However, the data and information will be available for review upon request.

# FULLY MISSION CAPABLE RATES ACROSS WEAPON SYSTEMS



Time by Quarter

Source--CINS  
OPR-HQ AFSC/MW

# OPENING MICAP INCIDENTS FOR SELECTED SAC A/C

Number of Incidents

300  
250  
200  
150  
100  
50  
0

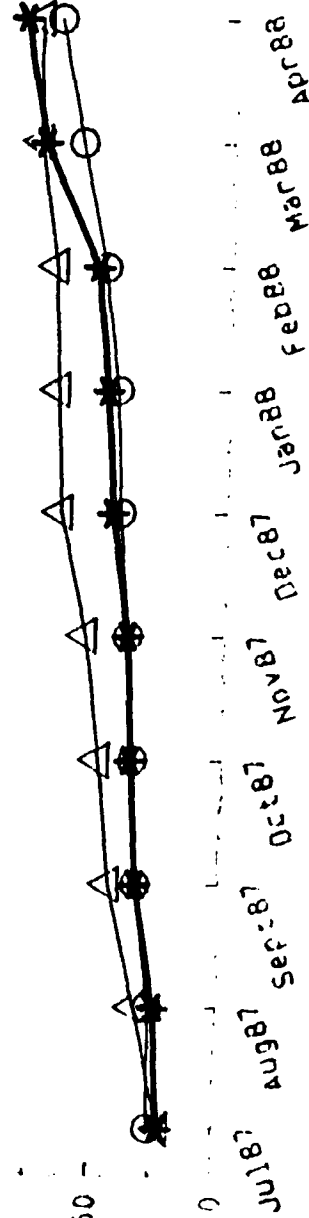
B-52 MICAPS



KC-135 MICAPS



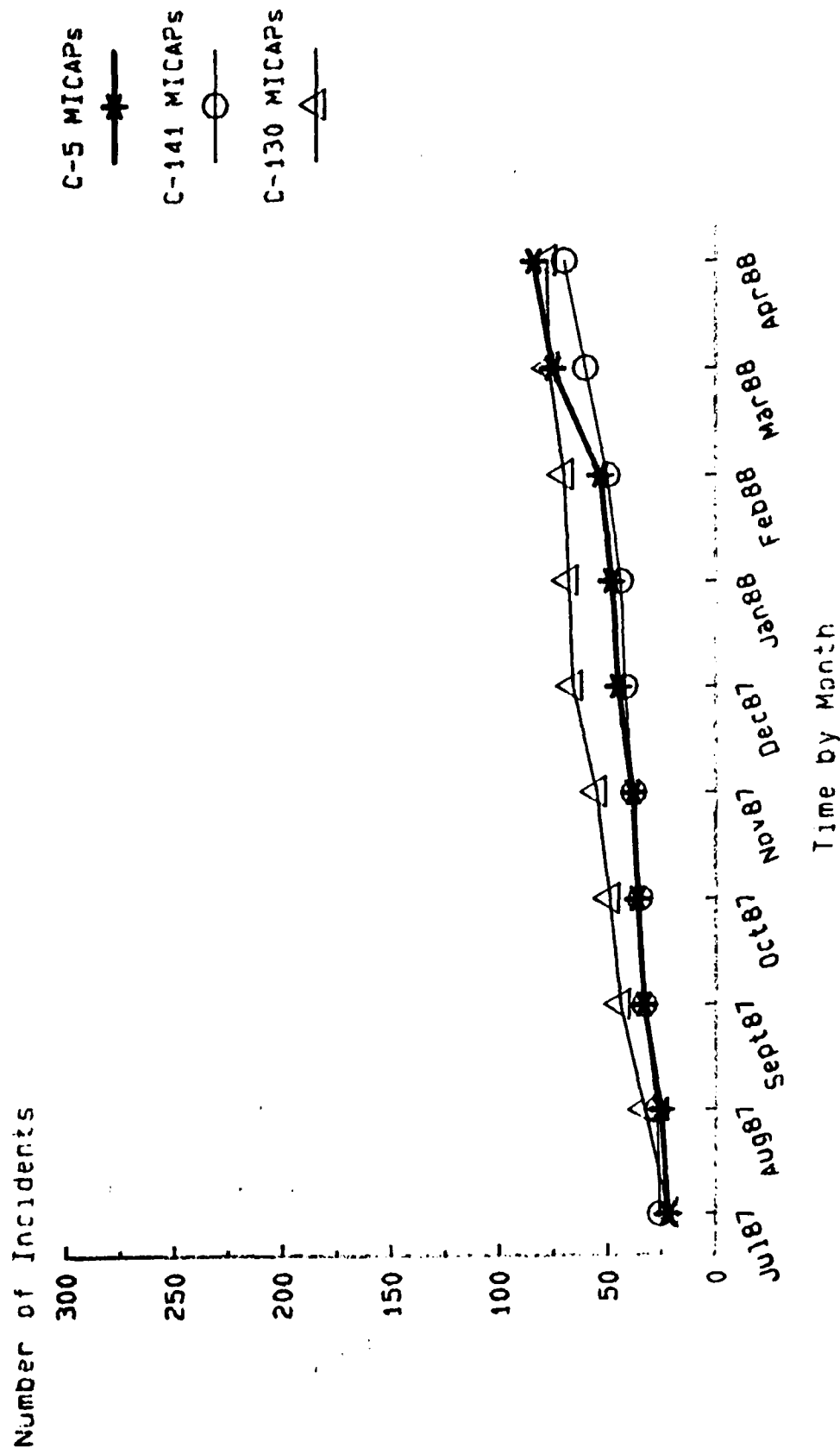
KS-10 MICAPS



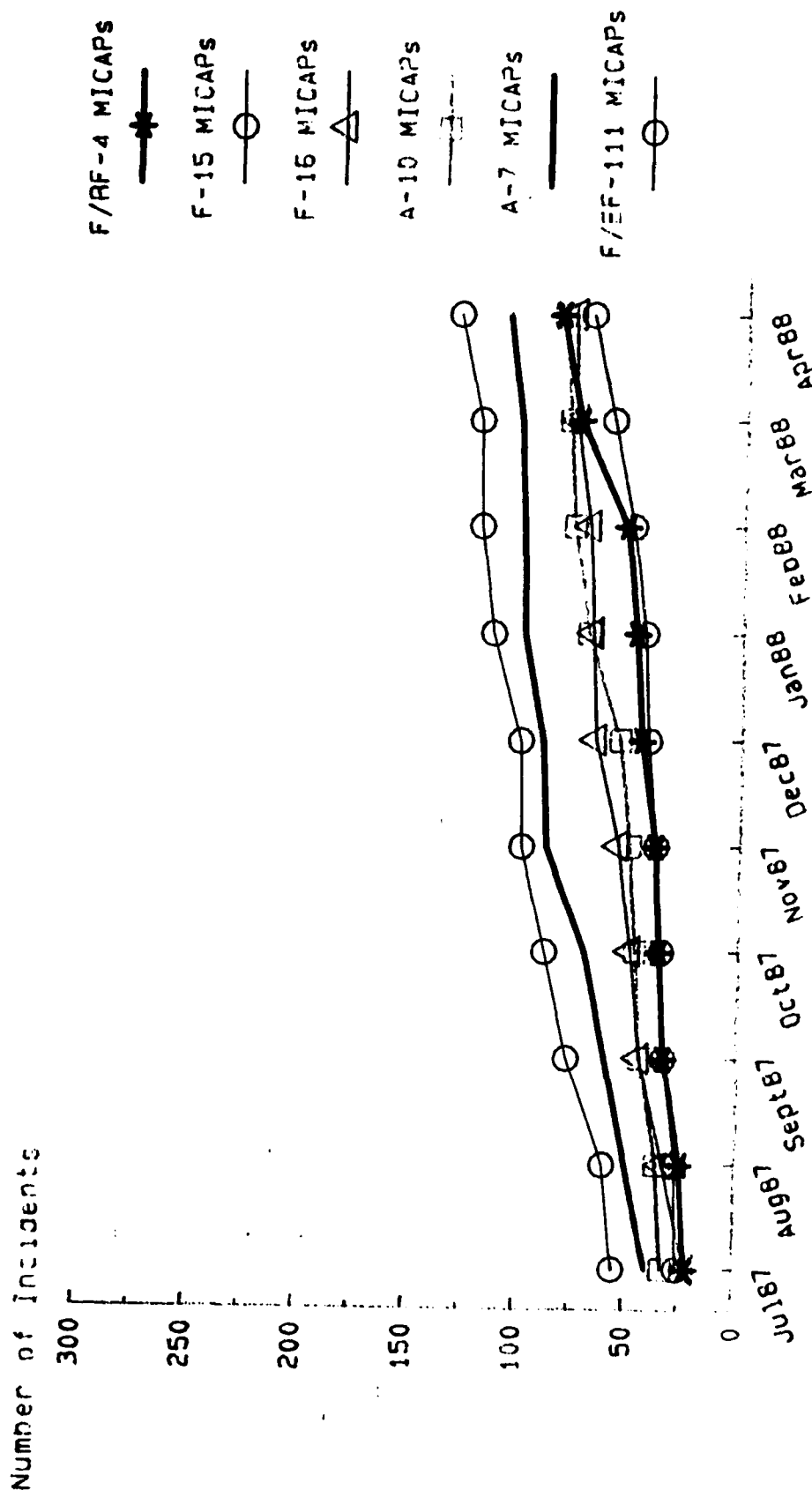
Time by Month

Source--WSMIS/RAH  
JPR-100/SP

# OPENING MICAP INCIDENTS FOR SELECTED MAC A/C

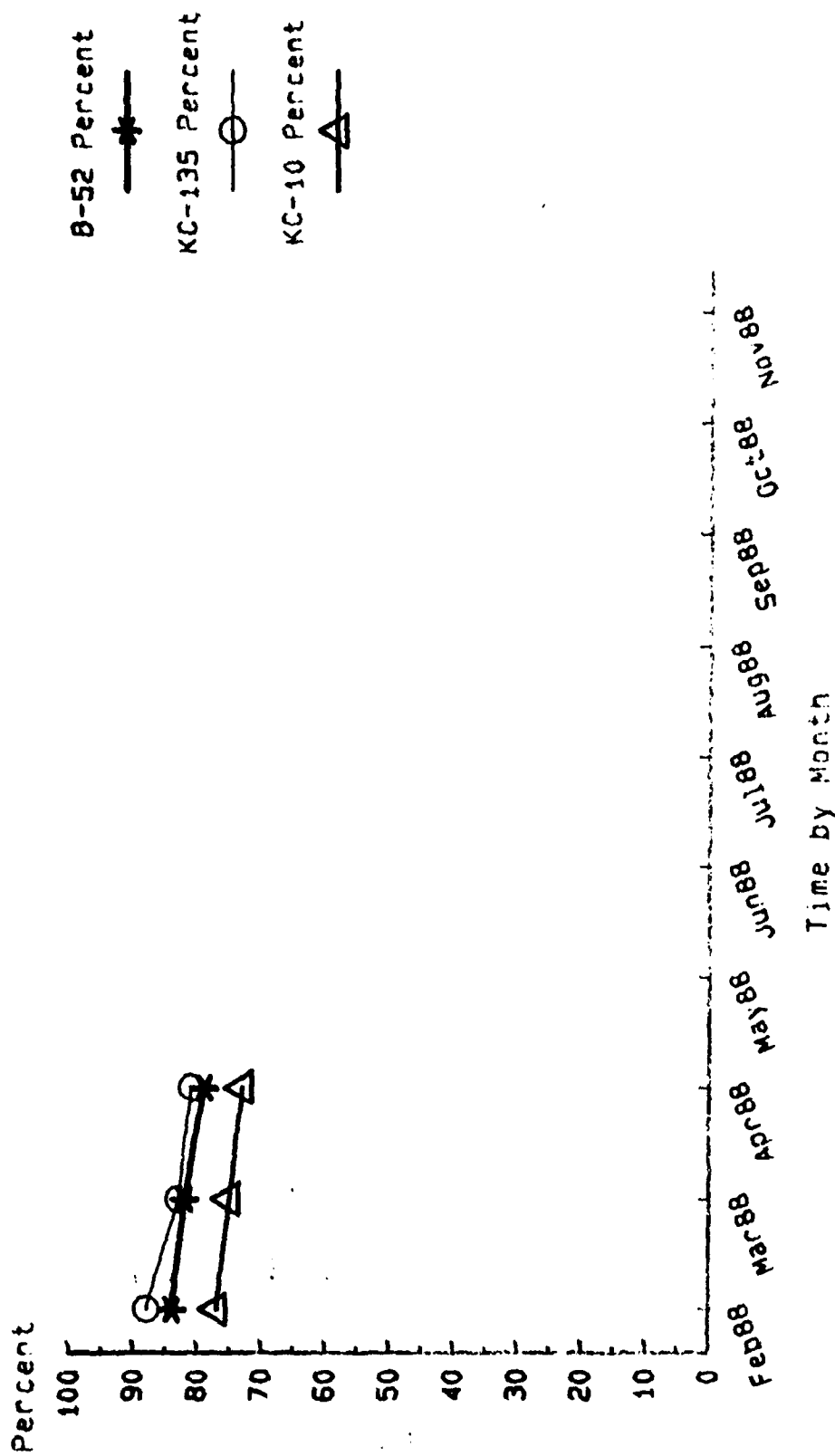


# OPENING MICAP INCIDENTS FOR SELECTED TAC A/C



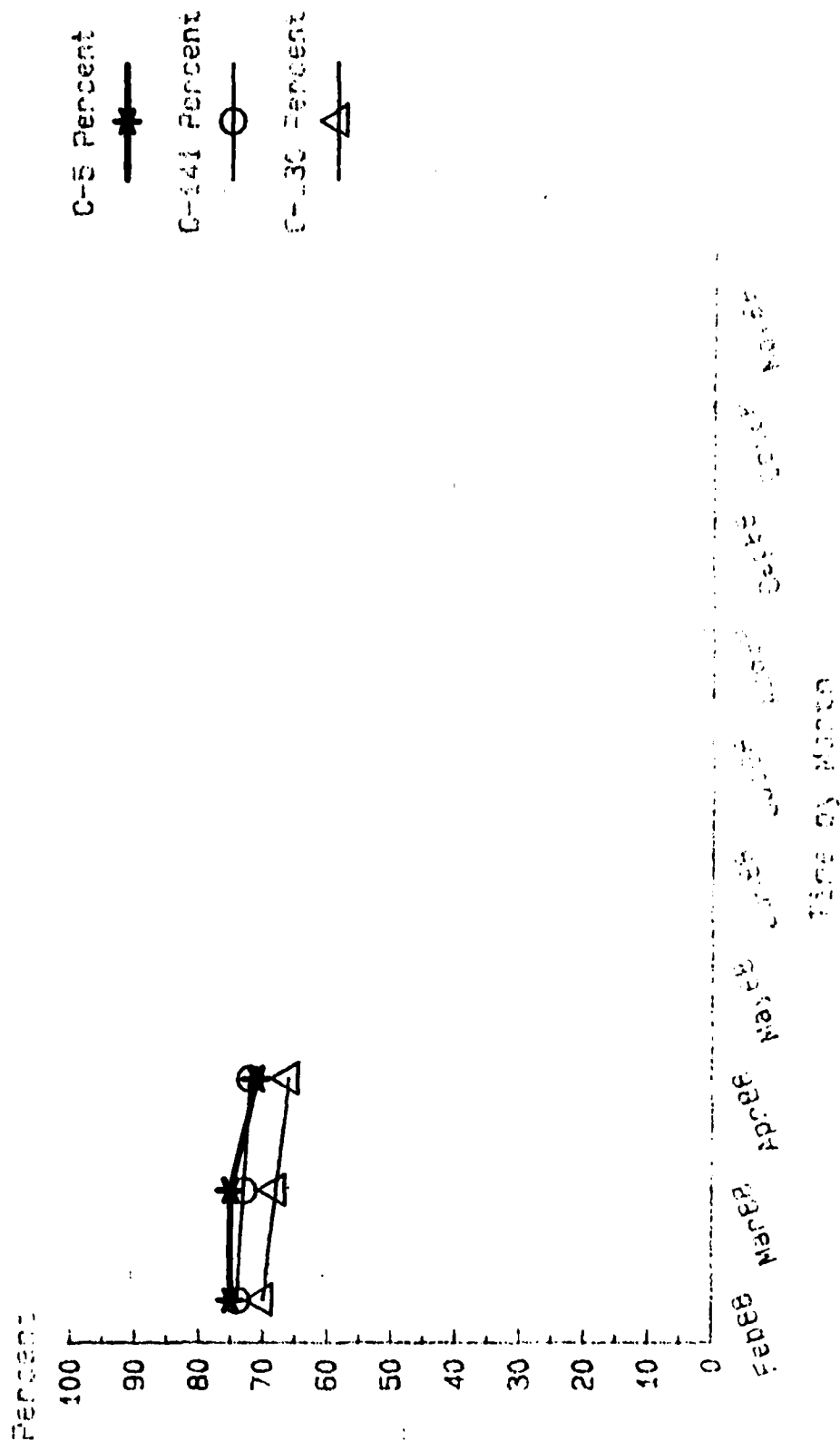
Source--WSMIS:RAM  
CRA-LOC/TL

# DAY 30 AVAILABLE AIRCRAFT FOR SELECTED SAC AIRCRAFT



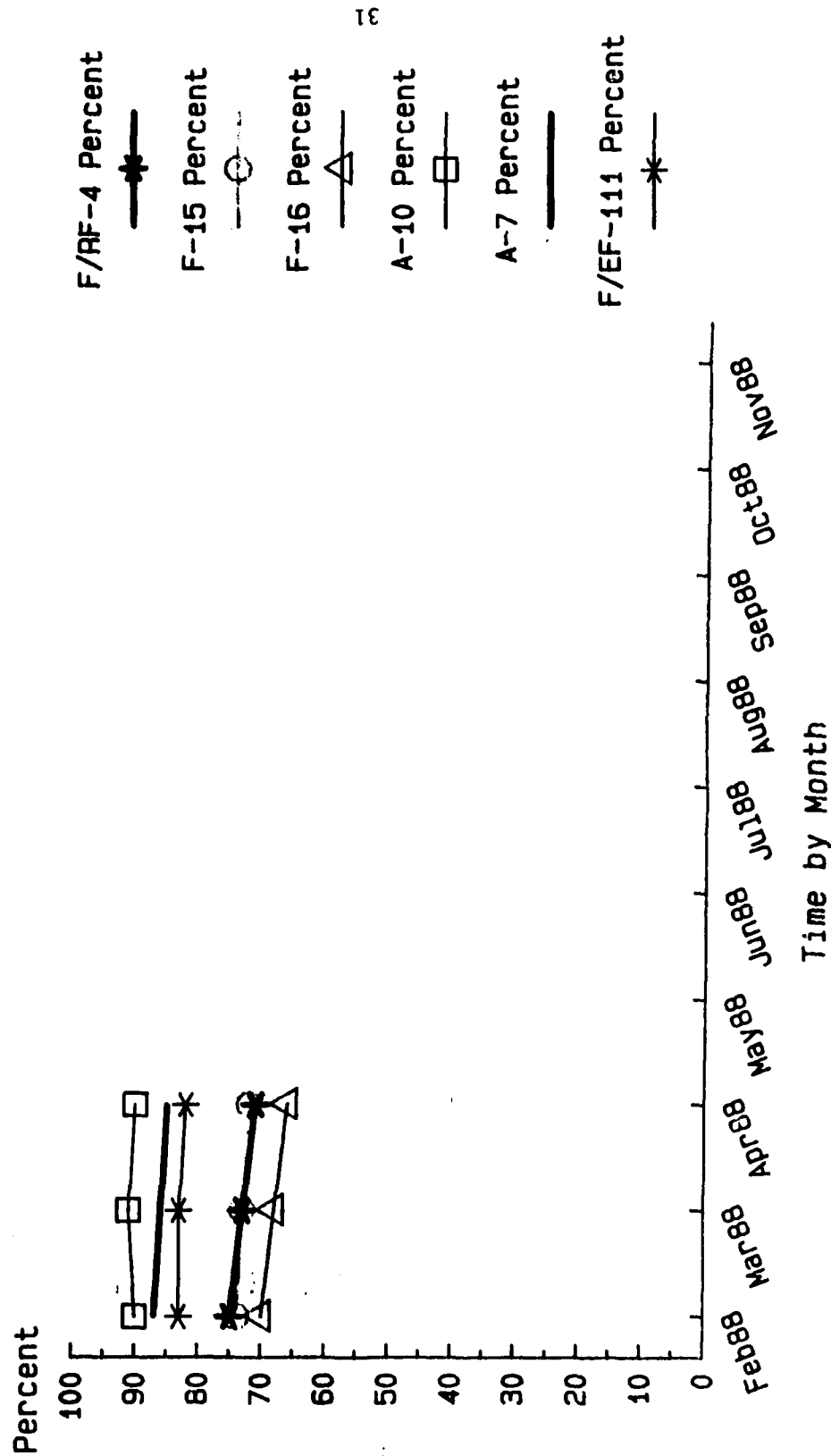
Source--NSMIS/SAM  
OPR-LOC/SD  
Aggregated Unit Level SAM Percentages

# DAY 30 AVAILABLE AIRCRAFT FOR SELECTED MAC AIRCRAFT



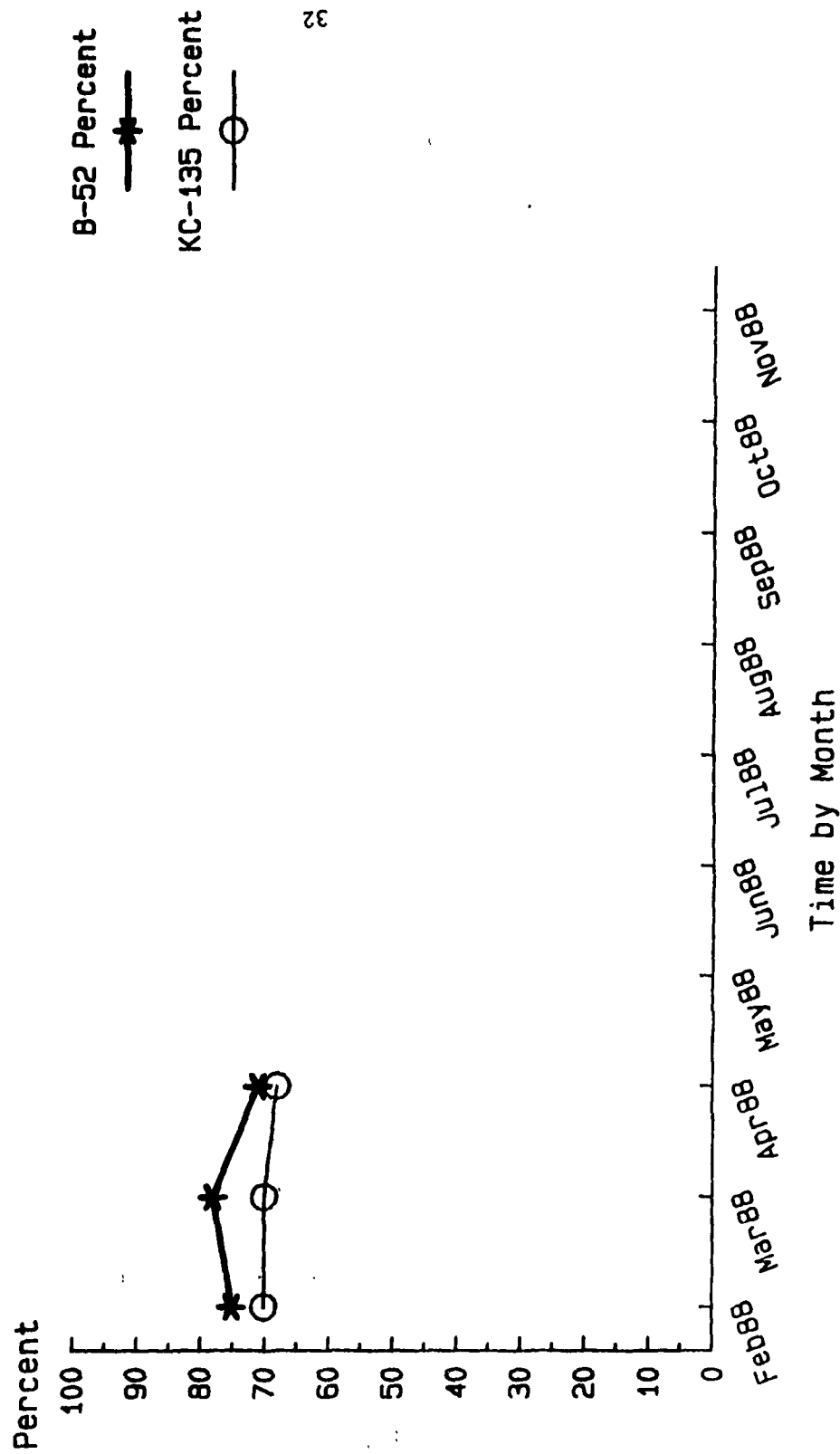
Source—Defense  
C-5, C-141,  
C-130  
Integrated

# DAY 30 AVAILABLE AIRCRAFT FOR SELECTED TAC AIRCRAFT



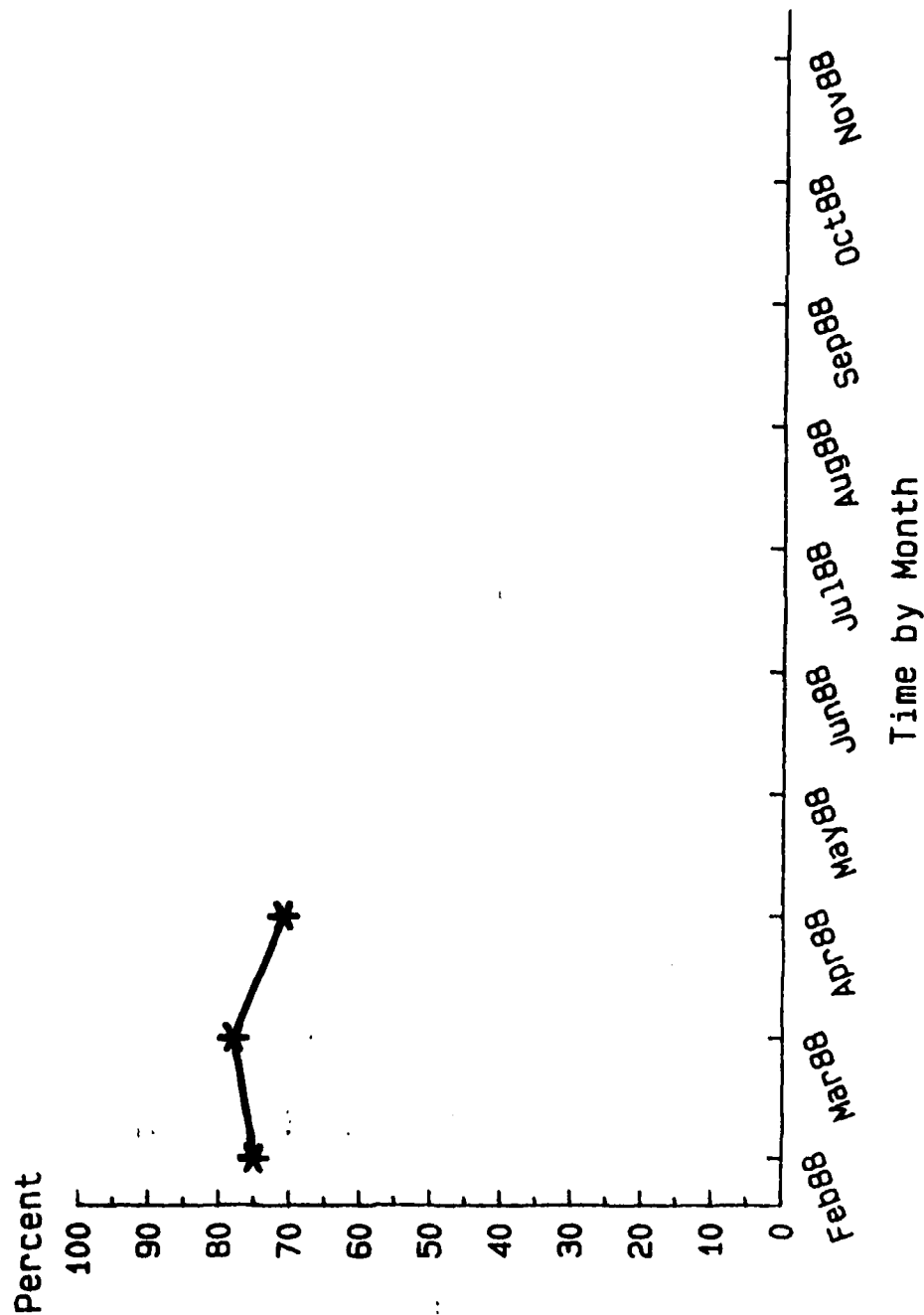
Source--WSMIS/SAM  
OPR-LOC/TL  
Aggregated Unit Level SAM Percentages

# TOTAL SORTIES FOR SELECTED SAC AIRCRAFT



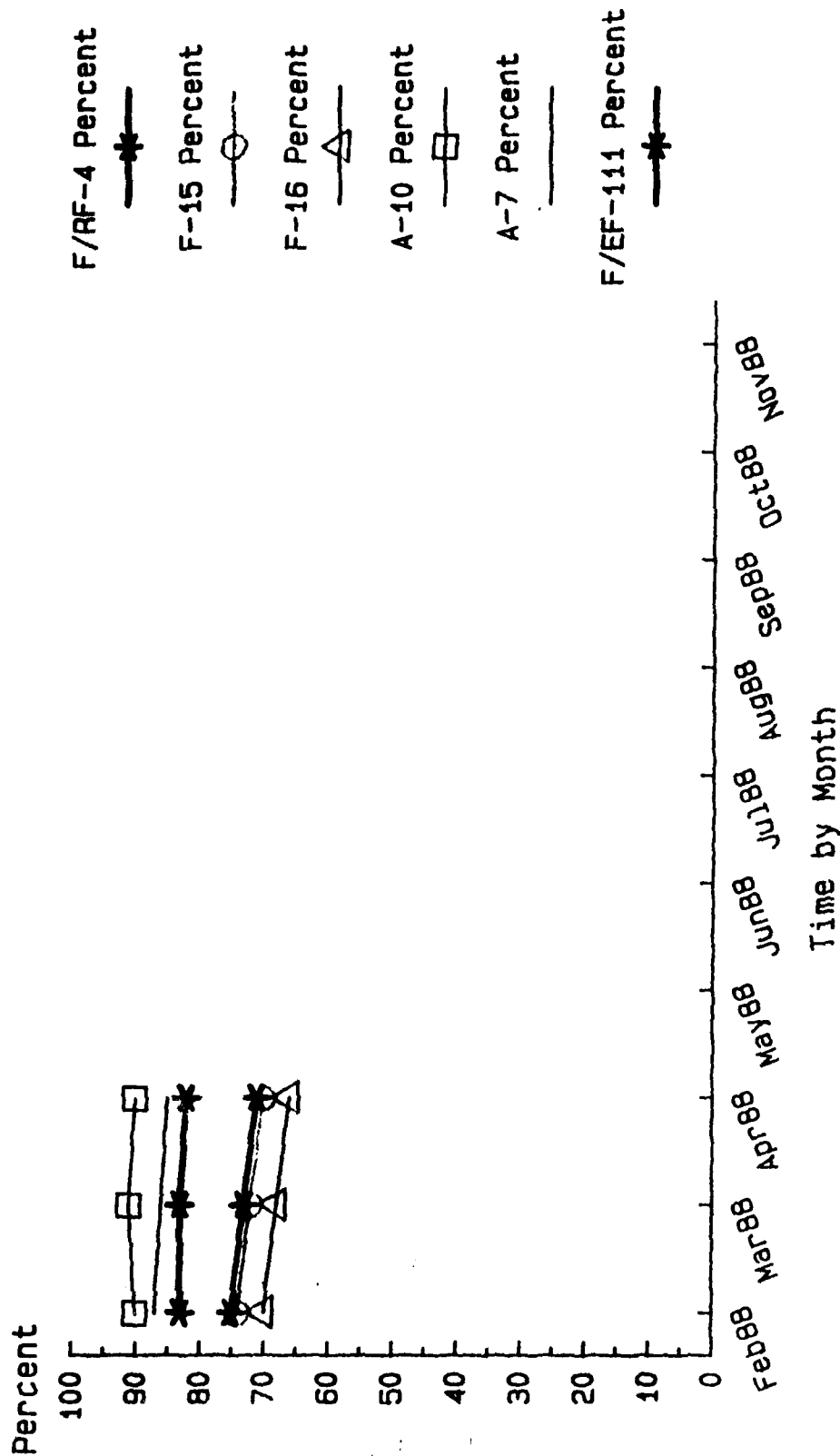
Source--WSMIS/SAM  
OPR-LDC/SD  
Aggregated Unit Level SAM Percentages

# TOTAL SORTIES FOR SELECTED MAC AIRCRAFT



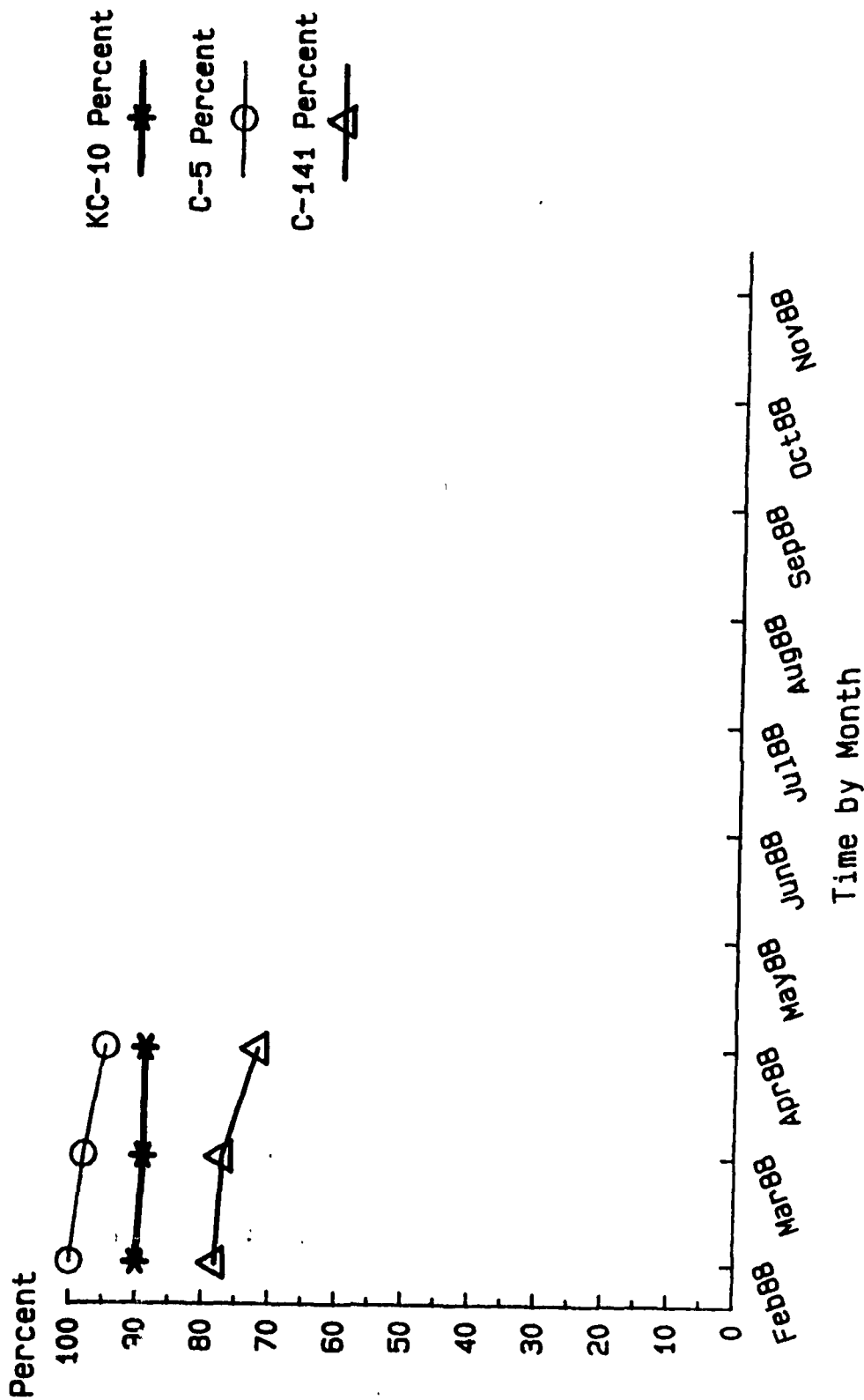
Source--WSMIS/SAM  
OPR-LOC/AT  
Aggregated Unit Level SAM Percentages

# TOTAL SORTIES FOR SELECTED TAC AIRCRAFT



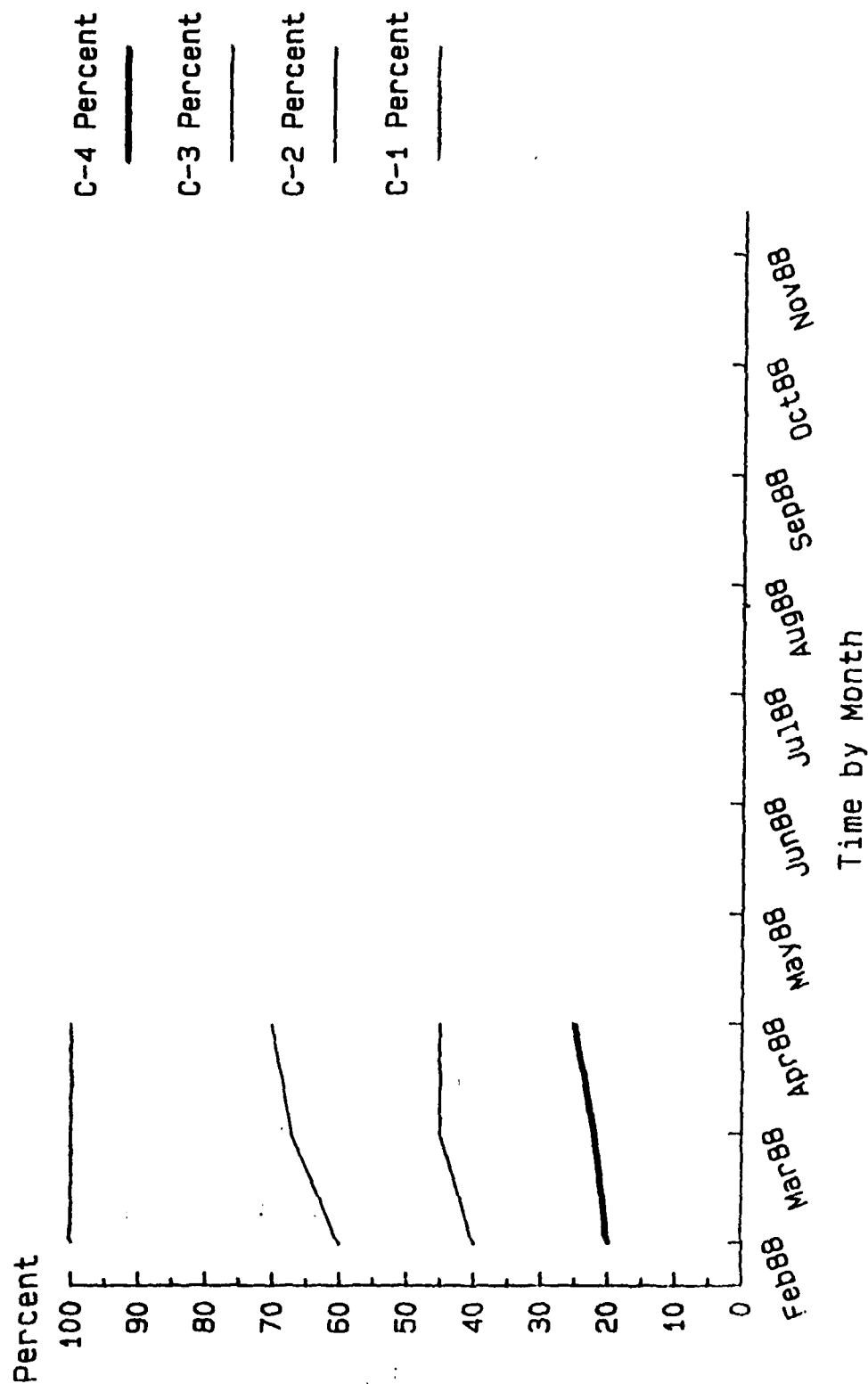
Source--WSMIS/SAM  
OPR-LOC/TL  
Aggregated Unit Level SAM Percentages

# WRSK/BLSS FILL RATES AIRCRAFT NOT IN WSMIS/SAM



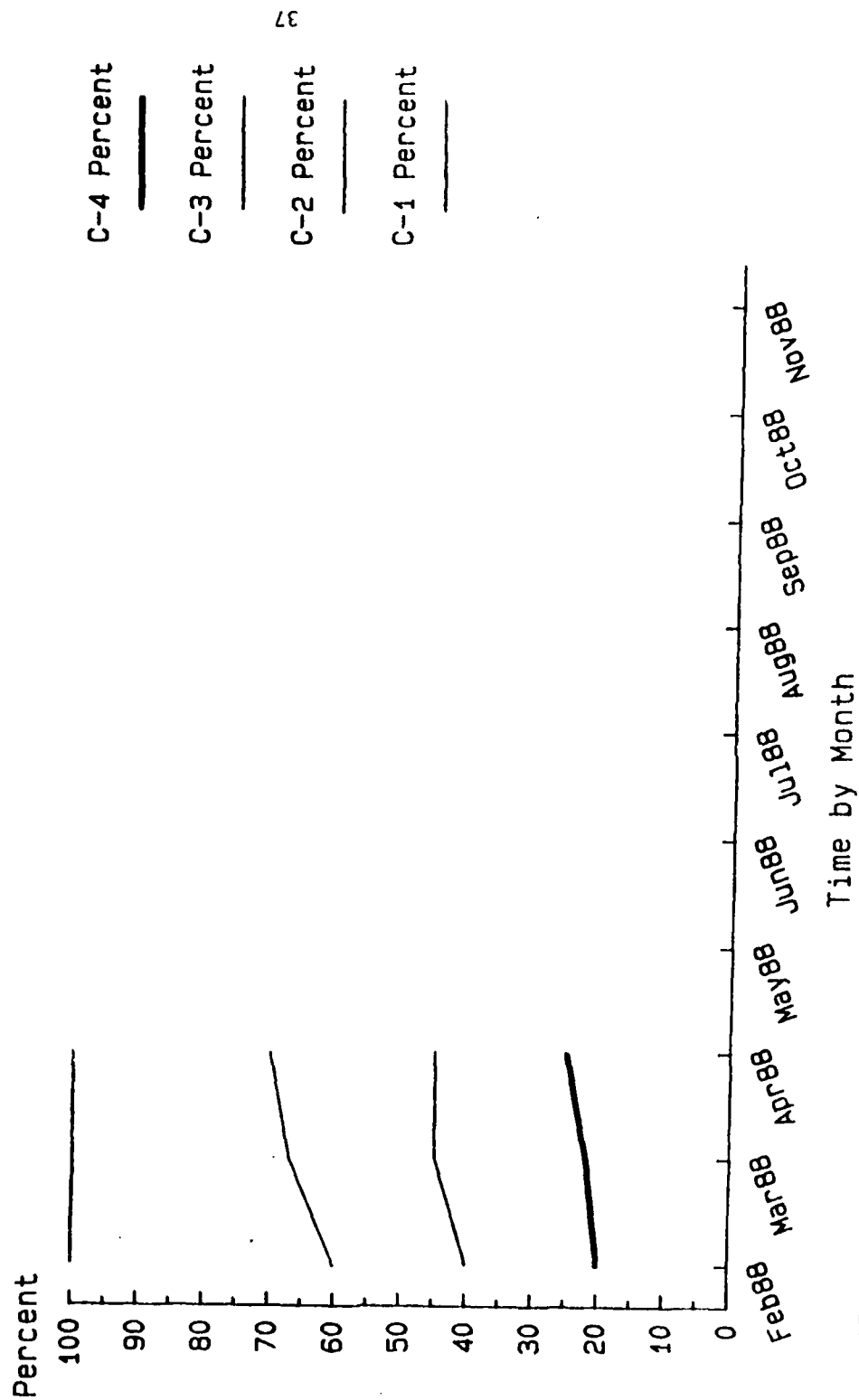
Source---  
OPR-LOC/SD/TL

# UNIT LOGISTICS C-RATINGS FOR THE C-5 AIRCRAFT



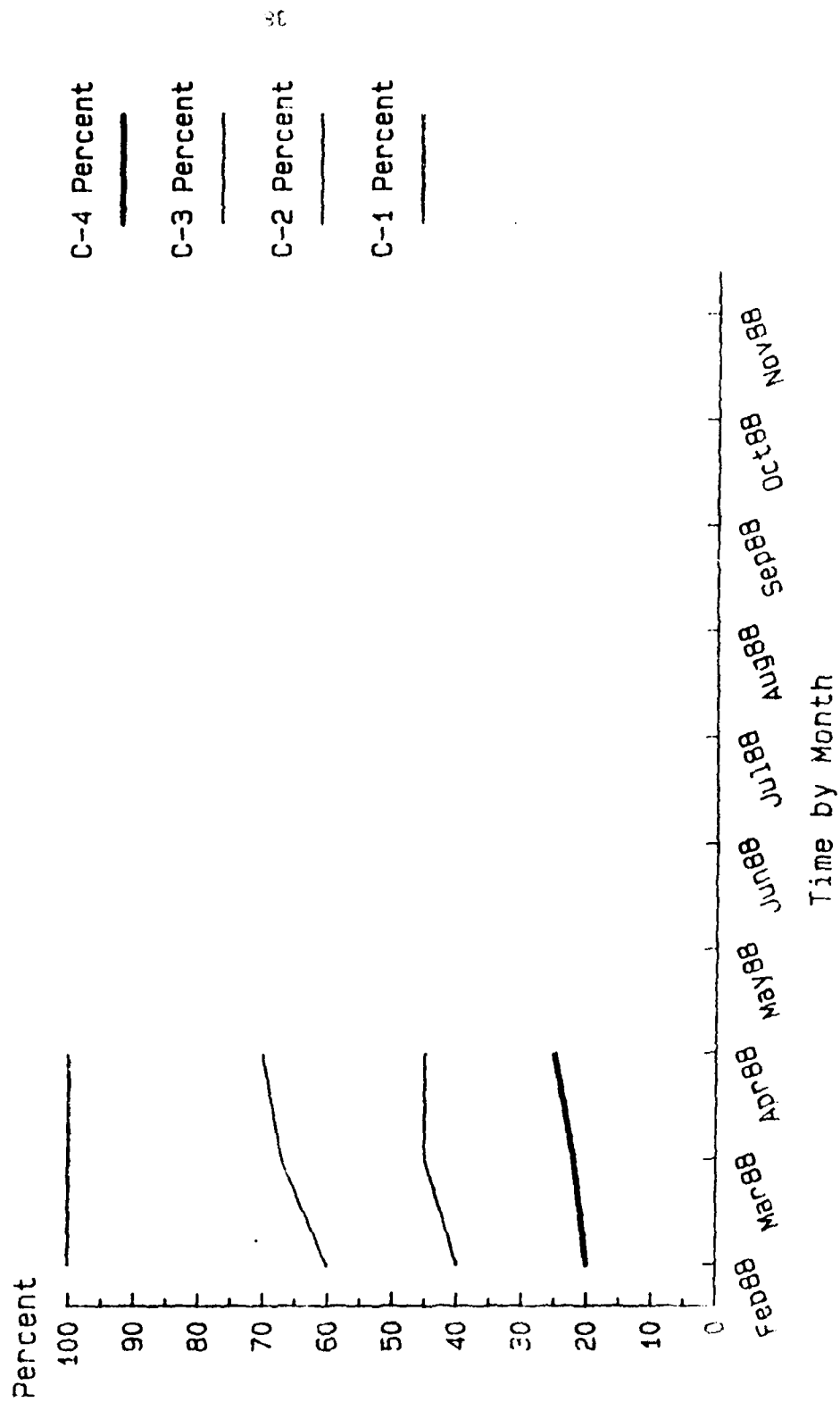
Source--SORTS  
OPR-LOC/AT

# UNIT LOGISTICS C-RATINGS FOR THE C-141 AIRCRAFT



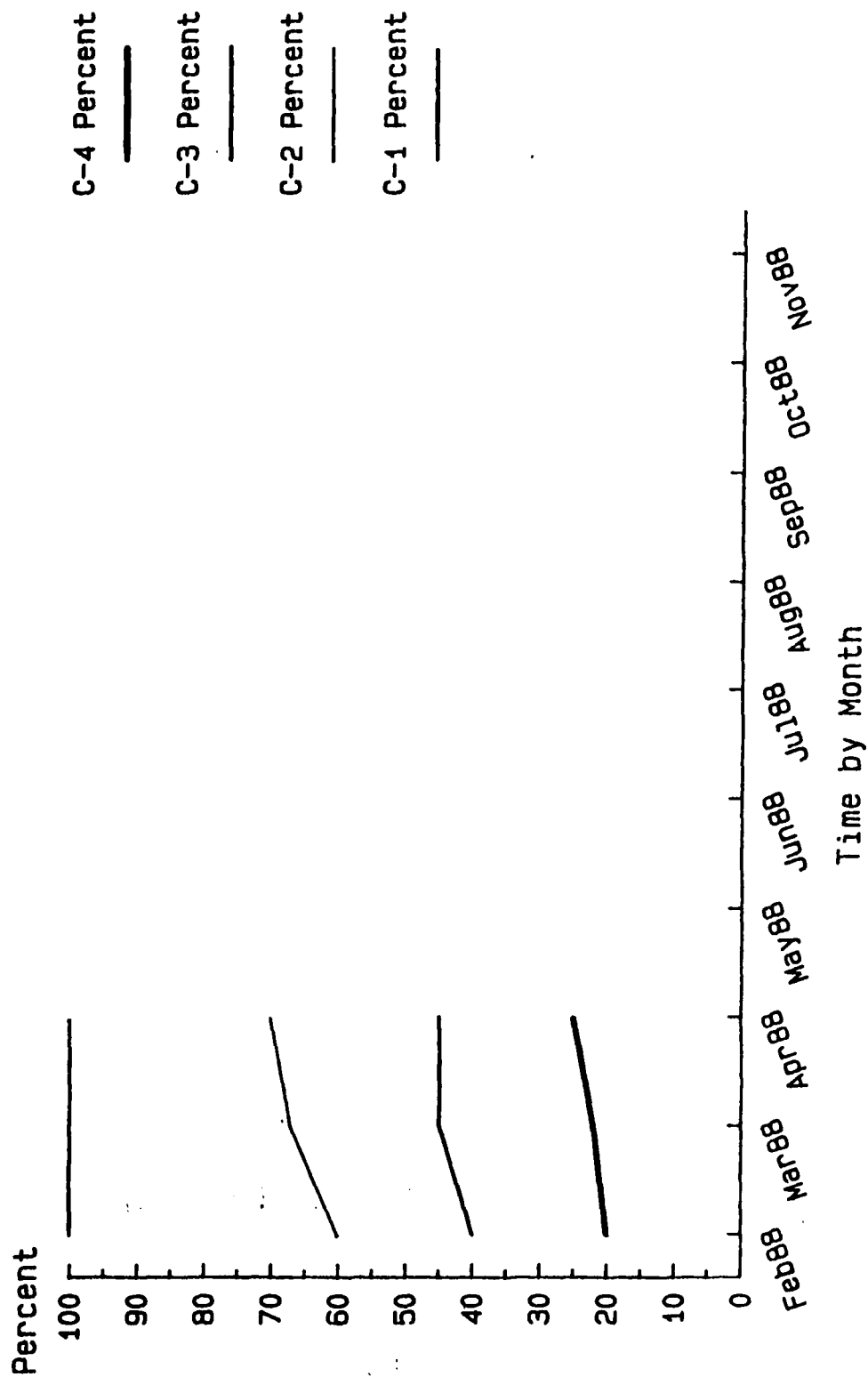
Source--SORTS  
OPR-LOC/AT

# UNIT LOGISTICS C-RATINGS FOR THE C-130 AIRCRAFT



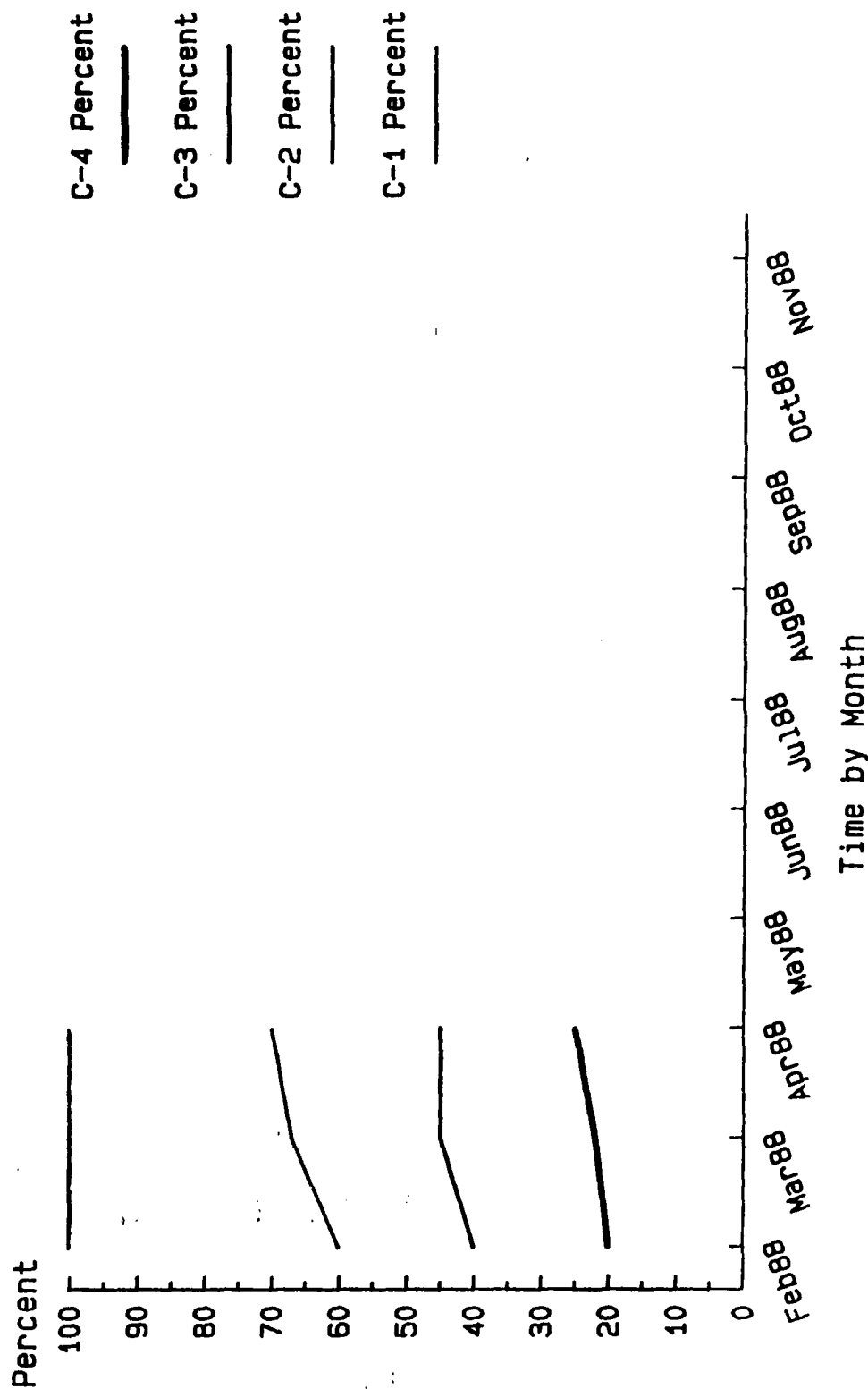
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# UNIT LOGISTICS C-RATINGS FOR THE B-52 AIRCRAFT



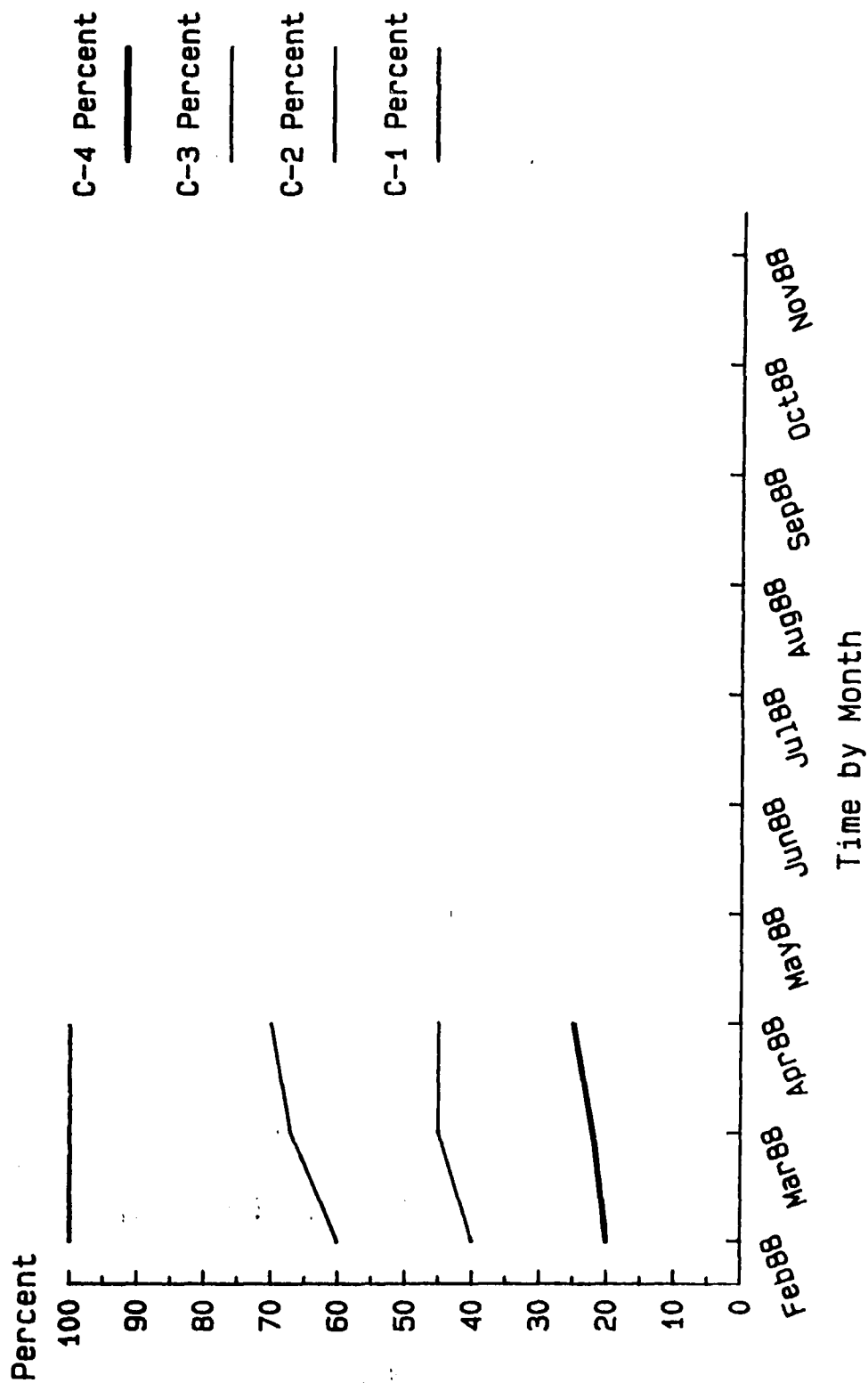
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OPR-LOC/AT

# UNIT LOGISTICS C-RATINGS FOR THE KC-135 AIRCRAFT



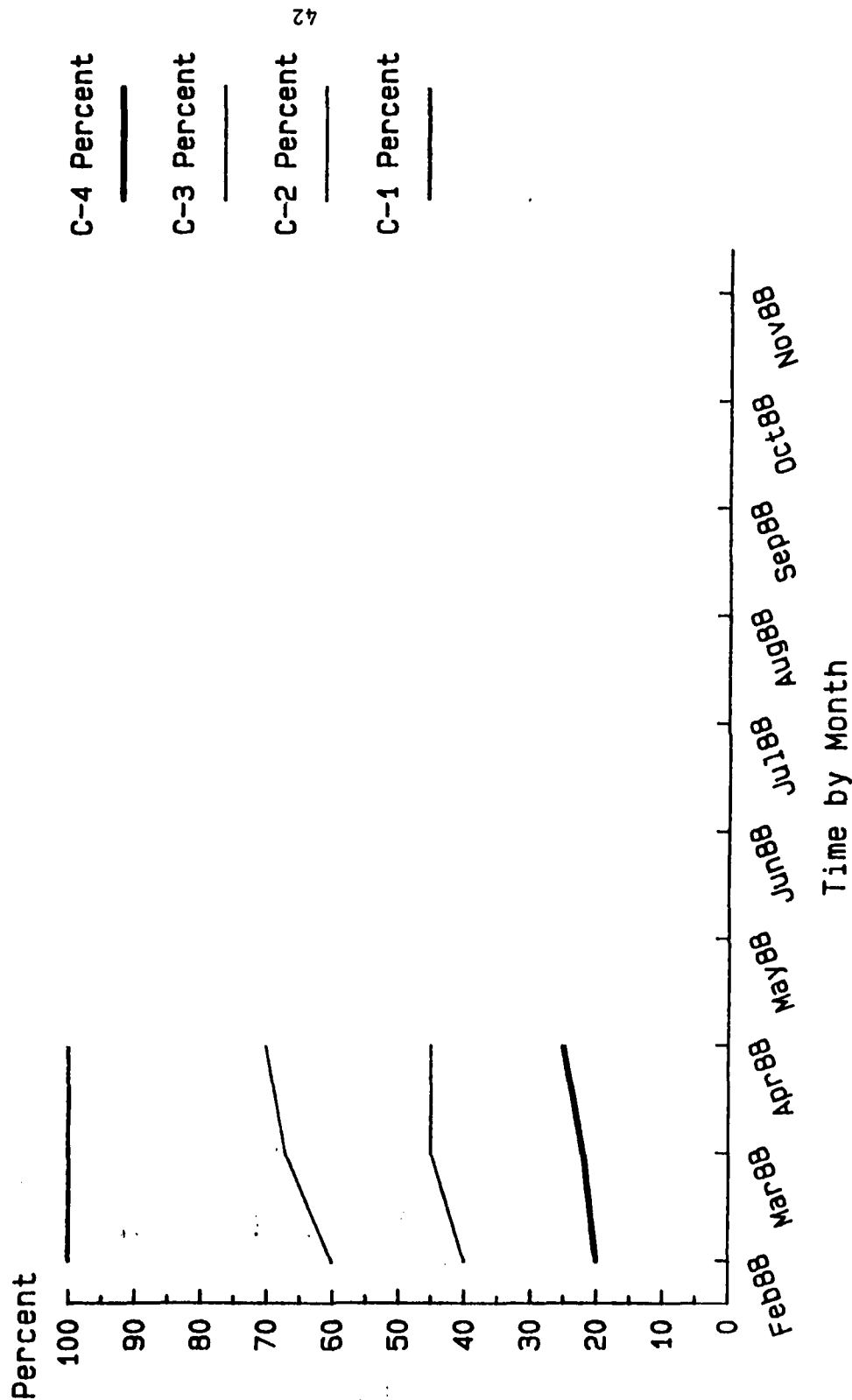
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OPR-LOC/AT

# UNIT LOGISTICS C-RATINGS FOR THE KC-10 AIRCRAFT



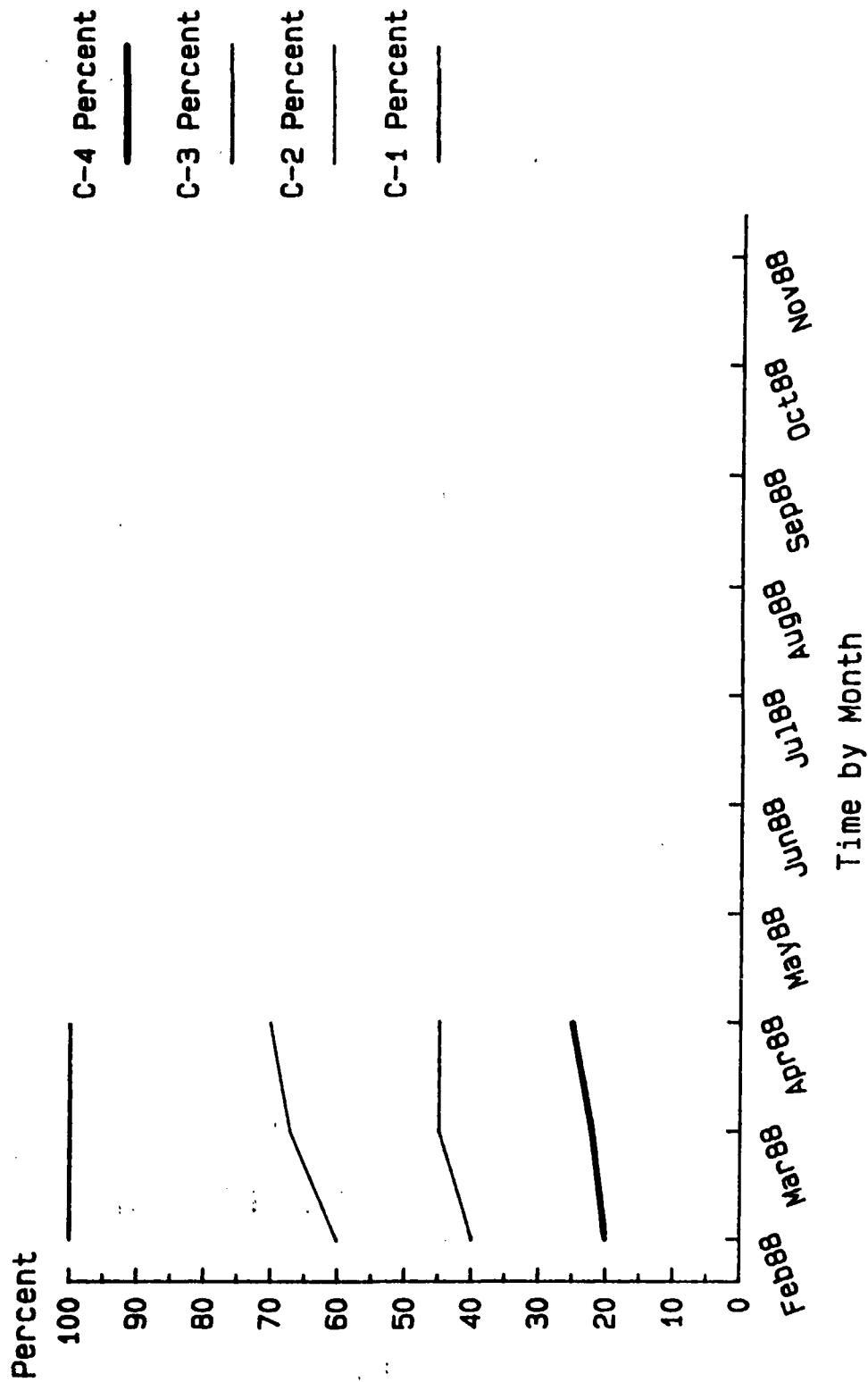
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# UNIT LOGISTICS C-RATINGS FOR THE F/RF-4 AIRCRAFT



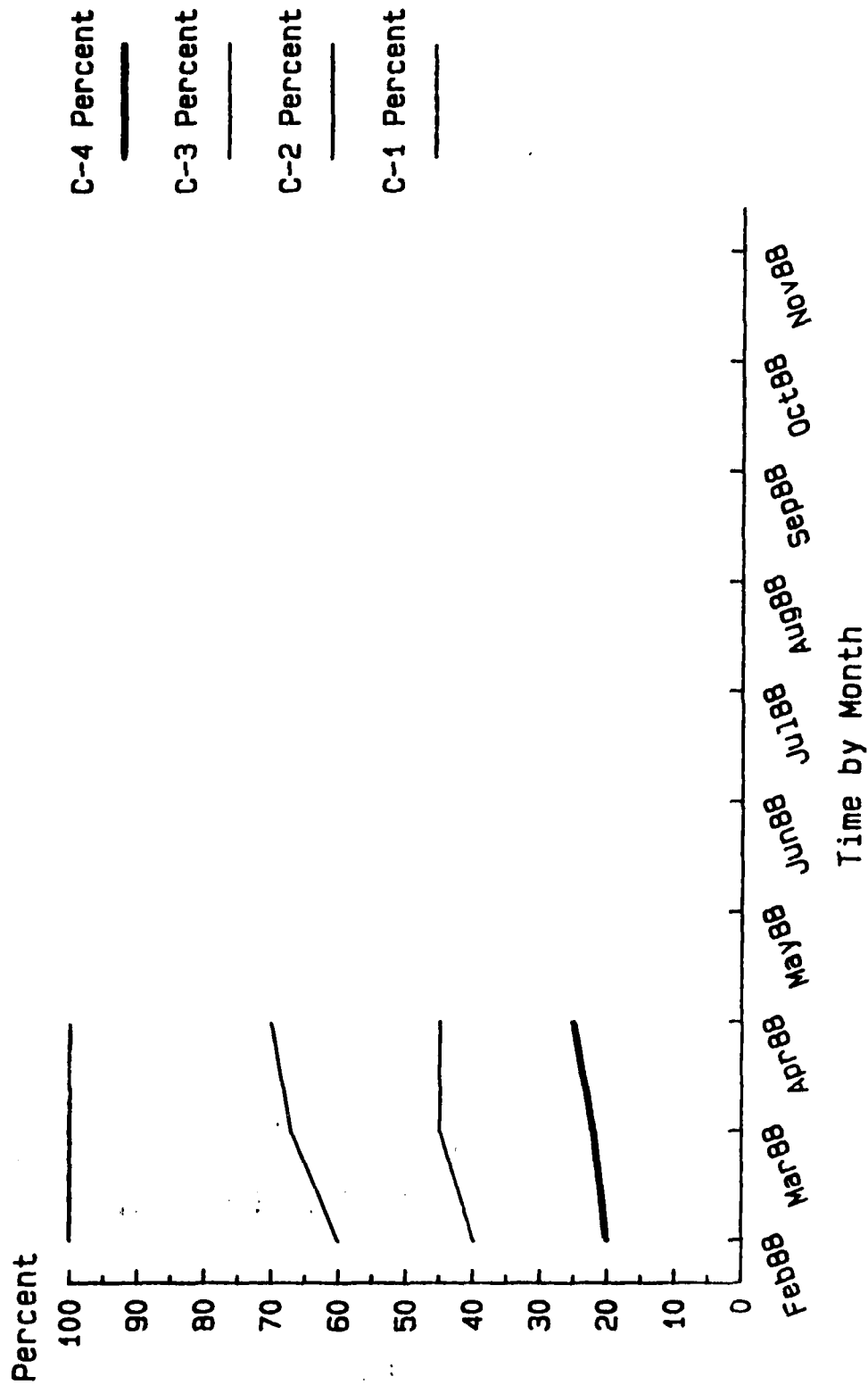
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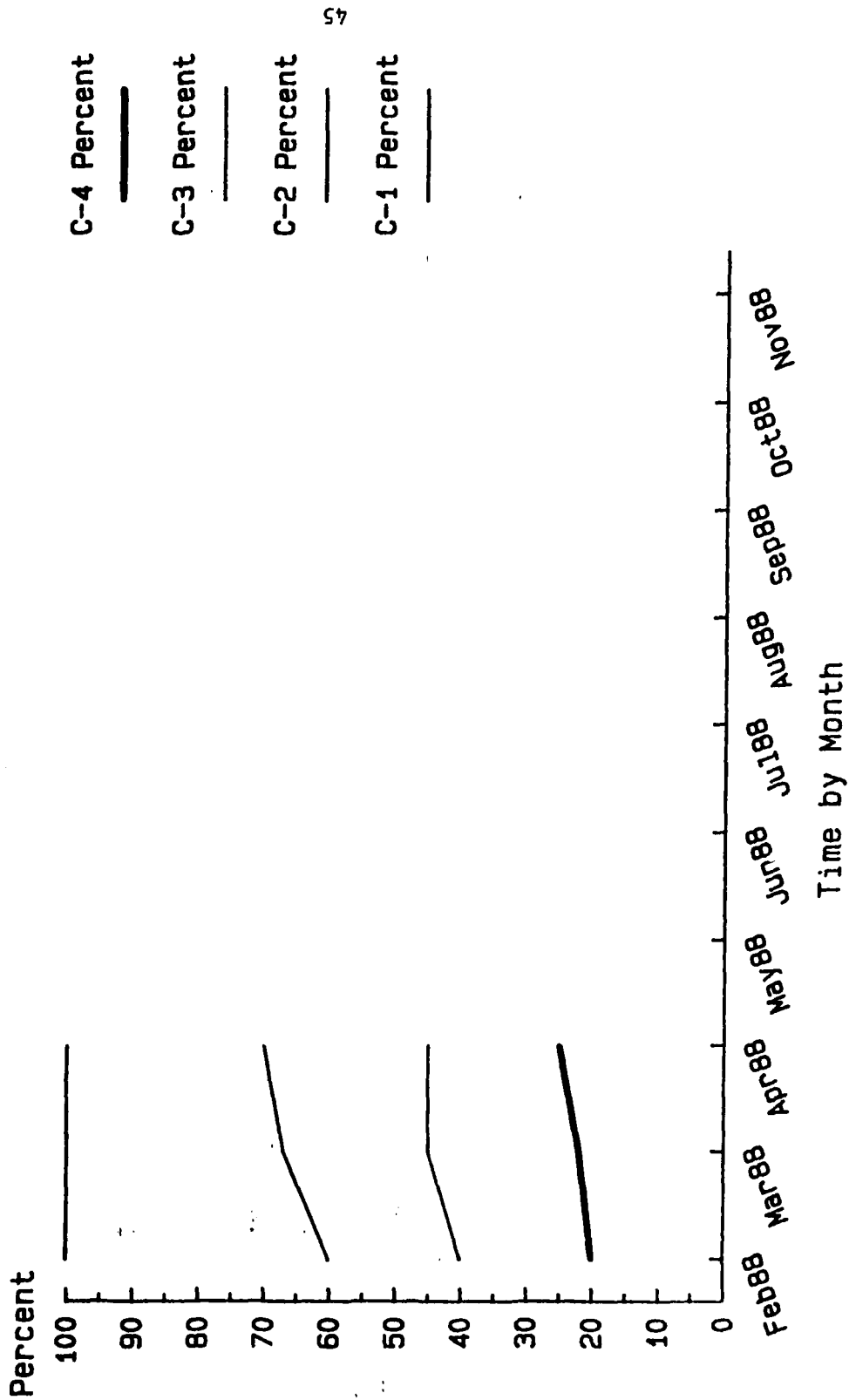
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OPR-LOC/AT

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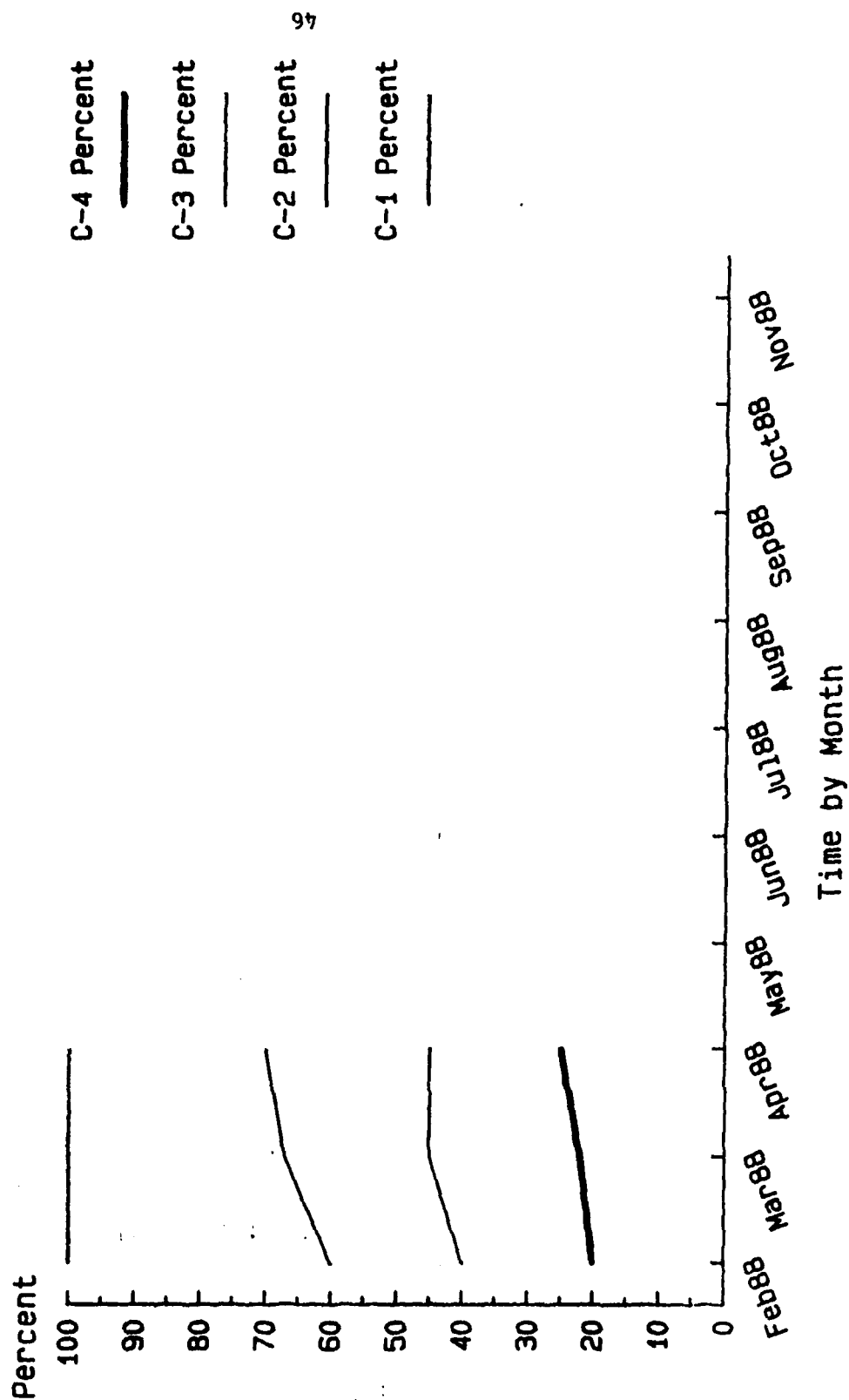
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# UNIT LOGISTICS C-RATINGS FOR THE A-10 AIRCRAFT



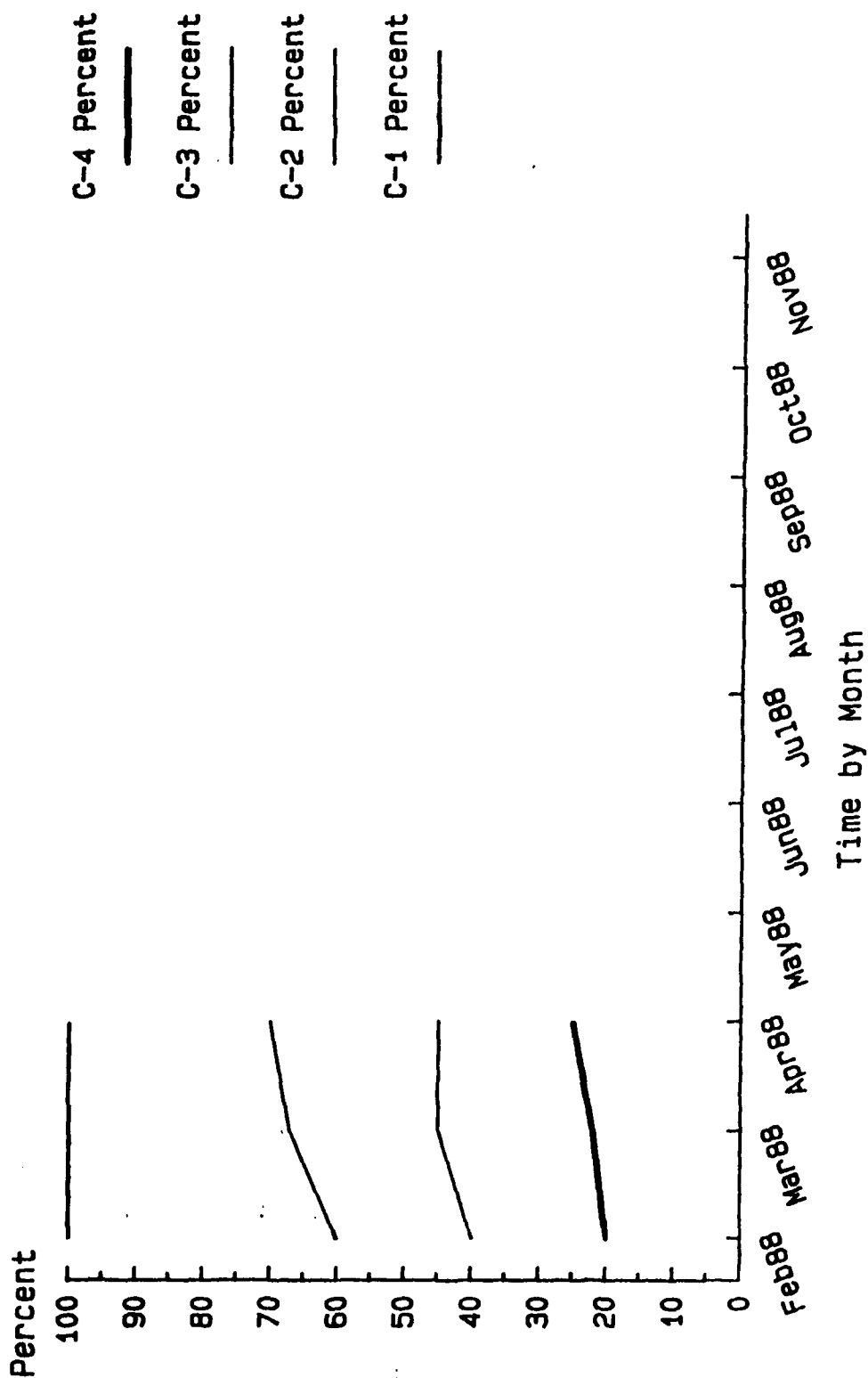
Source--SORTS  
OPR-LOC/AT

# UNIT LOGISTICS C-RATINGS FOR THE A-7 AIRCRAFT



Source--SORTS  
OPR-LOC/AT

# UNIT LOGISTICS C-RATINGS FOR THE F/EF-111 AIRCRAFT



Source---SORTS  
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DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS AIR FORCE LOGISTICS COMMAND  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-5001

08 JUL 1989

REPLY TO  
ATTN OF: **MM**

SUBJECT: Depot Purchased Equipment Maintenance (DPEM) Indicators

TO: See Distribution List

1. The Air Force currently does not have a method for quantifying the effects of changes in the level of DPEM funding. The Air Force needs to identify the impact of the DPEM funds shortage to assess our performance, to adjust our funding allocation and repair policy if necessary, and to defend against future budget reductions.

2. We have identified a method for quantifying the effects of changes in DPEM funding. This report (see Attachment 2) documents the development of a series of indicators that can be used to show the effects of changes in DPEM funding on depot operations, base operations, and operational command operations. We recommend the use of these indicators for both tracking the effect of current funding shortfalls and for defending against future budget cuts. We provide all of our conclusions and actions in Attachment 1.

3. Point of contact is Mr Bob Appelbaum, HQ AFLC/MMMA, AUTOVON 787-5269.

FOR THE COMMANDER

*Marvin L. Davis*

MARVIN L. DAVIS, Colonel, USAF  
Director, Materiel Requirements  
and Financial Management  
DCS/Materiel Management

2 Atch  
1. Conclusions and Actions  
2. Final Report

UNITED STATES AIR FORCE



SEPTEMBER 18, 1947

## CONCLUSIONS AND ACTIONS

### CONCLUSIONS

1. The current system does not include a method for quantifying the effects of changes in the level of the Depot Purchased Equipment Maintenance (DPEM) funding.
2. AFLC needs a series of indicators in order to "build" a true picture of the effects of changes in DPEM funding, identify the impact, and justify future repair requirement budgets.
3. Performance indicators must consider not only direct support indicators but also indicators showing indirect forms of support.
4. We have identified a series of indicators that will identify the depot, base, and mission impact of DPEM under funding.

### ACTIONS

1. Construct a data base that contains all of the data required to produce the indicators outlined in this report. (OPR: HQ AFLC/MMM)
2. Develop an automated method for producing this set of indicators on a quarterly basis. (OPR: HQ AFLC/MMM)
3. Use these indicators as the method for showing the effects of changes in the level of DPEM funding and justifying future repair requirement budget submissions. (OPR: HQ AFLC/RRSC)